SAMPLING AND ANALYSIS PLAN

PLACE BRIDGE ELEMENTARY SCHOOL
1400 SOUTH ONEIDA STREET
DENVER, DENVER COUNTY, COLORADO

TARGETED BROWNFIELDS ASSESSMENT

Prepared for
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 8

Prepared by
WESTON SOLUTIONS, INC.
Region 8 Superfund Technical Assessment and Response Team

November 2018

Project Dates of Sampling:	December 2018
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GROUP A: PROJECT MANAGEMENT

A1. Title and Approval Sheet

Technical Directive Documents (TDDs): 0003/1804-06
Plan Title: Sampling and Analysis Plan (SAP) for Place Bridge Elementary School Targeted Brownfields Assessment (TBA)
Date (Revision, if necessary): 7/16/2018 (Rev. 1 11/12/2018 [Sections A6, B1, B2, Table 1, Figure 2, Worksheet 14, and Attachment D])
Prepared By: Weston Solutions, Inc. (WESTON) Superfund Technical Assessment and Response Team (START)

The undersigned approves the entire Unified Federal Program (UFP)-Quality Assurance Project Plan (QAPP) document that includes this SAP and other elements that are found in the Region 8 Brownfields Program QAPP.

Lead Investigative Organization's Project Team Leader (PTL):	Roy Weindorf/START PTL *Printed Name/Title*
	Signature/Date
Lead Investigative Organization's Project Manager (PM):	Roy Weindorf, P.G./START PM *Printed Name/Title*
	Signature/Date
Lead Investigative Organization's Quality Assurance (QA) Manager:	Tana Jones/START QA Manager *Printed Name/Title*
	Signature/Date
Federal Regulatory Agency:	Environmental Protection Agency (EPA)
Work Assignment Manager (WAM)/ Delegated Approval Officer (DAO):	Tim Rehder/EPA WAM and DAO *Printed Name/Title*
	Signature/Date
Document Control Numbering System:	W0592.1E.01667

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A3. Distribution List

Name	Title/Role	Organization
Tim Rehder	WAM	EPA
Lauren DeBell	Senior Real Estate Associate / TBA Applicant	Urban Land Conservancy
Debra Bustos	Senior Vice President of Real Estate / TBA Applicant	Urban Land Conservancy
Roy Weindorf	PM/PTL	START

A4. Project/Task Organization

The project team organization is illustrated on the Worksheet 3 & 5 chart included in Attachment A. Brief biographies of key START technical staff are provided in the following table:

Roy Weindorf, P.G.		
Project Title / Role	**Education / Experience**	**Special Training / Certifications**
PM / Operational point of contact for project level communications with EPA WAMs, ensure performance associated with the contract, coordinate and communicate with EPA in the pre-planning phase of individual TDDs assignments, provide technical direction to PTL, and support any functions delegated by the Program Manager.	Bachelors of Science (B.S.), Geology / Over 13 years of project experience including site management, conducting site assessments, Phase I Environmental Site Assessments (ESA), and Phase II ESAs. Technical, report, documentation, & field instrument proficiency including use of EM-31.	• 40-Hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) Training • 8-Hour OSHA Refresher Training • First Aid, Cardio Pulmonary Resuscitation (CPR), and Automated External Defibrillator (AED) • Professional Geologist (P.G.) licensed in Texas. • Federal Emergency Management Agency Incident Command System Levels 100, 200, 700, and 800 • Geoprobe® operation training

A5. Problem Definition/Background

Problem Definition

This Phase II ESA has been requested to determine the presence and/or extent of contaminants, if present, in order to facilitate redevelopment of the Site (Figure 1). The TBA applicant is interested in identifying any contamination present at the Site prior to the redevelopment of this property.

Based on the presence of a historic landfill, concerns exist regarding the exact boundary of the landfill and the presence of contaminants in soils, soil gas, and groundwater.

Background Information

The Site is currently an undeveloped lot north of a solar electric (photovoltaic) array and the Place Bridge School and south of a single family residential neighborhood. As stated in the Phase I ESA (WESTON, 2018), historic records indicate that the subject property was undeveloped with a drainage of Cherry Creek until 1961 and was utilized as a landfill until 1968. The property was capped

and remains a vacant lot. The Site is approximately 9.62-acres and is located on the east side of Denver, CO (Figure 1). The following list identifies past activities conducted at the Site and adjacent properties along with the current associated environmental risk:

- The presence of a former landfill – Previous excavation, site reconnaissance, interview, and aerial photos indicate the presence of a landfill at the subject property. The presence of the landfill indicates the potential presence of the following contaminants of concern (COCs):
    - *Soil* – volatile organic compounds (VOCs), semi-VOCs (SVOCs), Resource Conservation and Recovery Act (RCRA) metals, and asbestos.
    - *Groundwater* – VOCs, SVOCs, and RCRA metals.
- Elevated vapor concentrations represent a vapor encroachment condition (VEC) – Previous air monitoring and soil gas sampling indicate the presence of elevated methane concentrations. The presence of a VEC indicates the potential presence of the following COCs:
    - *Soil Gas* – VOCs, methane.

Project Objectives

This Phase II ESA will be conducted in accordance with ASTM, International (ASTM) E1903-11. The purpose of a Phase II ESA is to achieve the objectives set forth in the Statement of Objectives (SOO) developed by the user(s) and the Phase II Assessor. Goals for this Phase II ESA are to acquire and evaluate sufficient information to determine the location and concentration of potential environmental contamination at the Site, if present. The project objectives/SOO determined for the Site were as follows:

- Determine the approximate foot print of the historical landfill on the subject property.
- Assess and evaluate potential impacts to soils, soil gas, and groundwater for COC.
- Develop sufficient information to render a reasonable professional opinion whether hazardous substances either are or are not present at the Site with respect to the potential concerns assessed. If present, include concentrations of hazardous substances based on field screening and/or laboratory analysis of samples.
- Gather and provide sufficient data to assist the TBA recipient in making informed decisions with regard to the future use of the property; and
- Obtain sufficient data to support conceptual remediation cost estimating, if necessary.

Regulatory Information

Results of field screening and laboratory samples analyzed as part of this investigation will be compared against the following regulatory benchmarks.

Soils

- **EPA Regional Screening Levels (RSLs) - Generic Tables (November 2017): Target Cancer Risk (TR) = 1E-6 and Target Hazard Quotient (THQ) = 1.0** (EPA, 2017).
- **Colorado Department of Public Health and Environment (CDPHE) - Hazardous Materials and Waste Management Division: Groundwater Protection Values Soil Cleanup Table** (CDPHE, 2014).

Groundwater

- **EPA RSLs - Generic Tables (November 2017): TR = 1E-6 and THQ = 1.0** (EPA, 2017).
- **CDPHE Regulation NO. 41 – The Basic Standards for Groundwater** (CDPHE, 2016).

Asbestos Containing Material (ACM)

- **Asbestos-Containing Materials (40 Code of Federal Regulations [CFR] Part 763, Subpart E)** - ACM is defined as any material containing more than one percent (1%) asbestos.

A6. Project/Task Description

Field Tasks

Based upon the SOO developed, the following fieldwork tasks will be performed to assess potential contamination concerns at the Site. The proposed sample locations for assessment are presented in Figure 2. Additional details are presented in Section B1. Sampling Process Design (Experimental Design).

1) Geophysical Survey

- Walk EM-31 unit with data recorder tied to a Global Positioning System (GPS) unit over subject property in 20 feet (ft.) spaced transects.
- Process conductivity and in-phase data to determine approximate landfill boundary.

2) Soil Gas Investigation

- Install twelve soil gas sampling points (four within the approximate landfill boundary and eight along the perimeter of the boundary).
- Field screening of soil gas with a landfill gas analyzer (LGA) for methane and VOCs.
- Collect grab soil gas samples at select locations based on screening results for delineation (i.e. at locations with low methane/VOC concentrations to confirm the lack of a vapor hazard).

3) Soil/Groundwater Investigation

- Install six soil borings outside of the approximate landfill boundary to the groundwater interface. Locations will be biased toward areas of elevated VOC concentrations based on the soil gas screening and will include three locations on the downgradient (south and west) side of the landfill.
- Soil cuttings will be first visually screened by a licensed asbestos inspector for indications of ACM and a bulk sample will be collected, if present.
- Field screening using a photoionization detector (PID) of soil cutting.
- Collect a soil sample from the boring from the depth interval with the greatest PID response; depth interval with soil staining or other signs of impacts based on visual inspection; or, from the upper landfill interval (4-5 ft. below ground surface [bgs]) if no elevated PID readings or staining is observed.
- Collect a second soil sample from the boring from "clean" soil below apparently impacted soil (based on field screening); the depth interval greater than 2 ft. below the first sample (if

apparent impacts persist based on field screening); or, from the groundwater/soil interface (if no elevated PID readings or staining is observed).
- Collect a grab groundwater sample from the open borehole and record groundwater quality parameters.
- Document sample locations on a field map, in the logbook, and/or with GPS as appropriate.

4) Additional Soil/Groundwater Investigation

- Install two soil borings outside of the approximate landfill boundary to bedrock. Locations will be biased toward areas of elevated metals concentrations based on previous sampling.
- Collect three grab groundwater samples (one from each borehole and one from the existing monitoring well) for dissolved metals and record groundwater quality parameters.

Project Schedule and Deliverables

The project schedule for implementation and deliverables to be produced is presented on Worksheet 14 & 16 included in Attachment A.

A7. Quality Objectives and Criteria

The following are the Data Quality Objectives (DQOs) following the seven-step process.

1. State the Problem

The TBA applicant is interested in identifying any contamination present at the Site prior to the repurposing of this property. Additional information is presented in Section A5. Problem Definition/Background – Problem Definition.

2. Goals of the Study	3. Information Inputs	4. Boundaries of the Study[a, b]
Identify approximate extent of landfill	▪ EM-31 conductivity and in-phase data ▪ GPS location data	Entire subject property. Survey is expected to require one day.
Identify location and concentration COCs listed in A6, if present if soil gas.	▪ LGA screening results ▪ Analytical results from soil gas samples	Within and near the perimeter of the approximate landfill extent. Screening and sampling is expected to require one day.
Identify location and concentration of COC listed in A6, if present, in soils or groundwater	▪ Visual surveys for suspect materials in soil cuttings ▪ PID screening results ▪ Analytical results from soil and groundwater samples	Subsurface soil from surface to groundwater and groundwater near the approximate landfill extent. Screening and sampling is expected to require one day.

a. Site activities are scheduled to occur in July 2018.

b. Practical constraints on data collection: Site entry will be limited by site access agreements with the site owner and adjacent property owners whose land needs to be traversed to access the Site, as applicable. Field constraints may include equipment and sampling limitations due to weather conditions and accessibility due to debris present at the Site. Physical constraints may also include difficulty collecting data near the PV array. Scheduling adjustments will be made if physical constraints on planned field events occur as well as for safety considerations. Areas deemed unsafe will not be entered or sampled. If any areas are determined to be too hazardous to access for sampling the location will be recorded in the field logbook and no sample(s) collected.

5. Develop the Analytical Approach

The analytical approach is presented in Sections A6. Project/Task Description, B1. Sampling Process Design (Experimental Design), and B4. Analytical Methods. All valid analytical results for each media sampled will be compared to the applicable screening benchmarks and/or regulatory criteria presented in Section A5. Problem Definition/Background – Regulatory Information.

6. Specify the Performance or Acceptance Criteria

- If contaminants are detected at levels below applicable benchmarks at the Site, then the redevelopment project can proceed.
- If contaminants are detected at levels equal to or greater than applicable benchmarks at the Site, then additional evaluation will be needed to determine: 1) if further assessment to characterize and/or delineate the extent of the contamination is needed, and 2) if remediation may be required prior to redevelopment.

Performance/measurement criteria for information to be collected is presented in Worksheet 12 included in Attachment A. Project action limits and laboratory detection limits for parameters of interest are presented in Worksheet 15 included in Attachment A. Assessment of data usability generated as part of this assessment is presented in Worksheet 37 included in Attachment A. An assessment of information obtained from other sources (e.g., previous studies, secondary data uses, etc.) used in this assessment for the acceptance criteria is included in References.

7. Develop the Detailed Plan for Obtaining Data

The detailed plan for obtaining data is presented in Group B: Data Generation and Acquisition.

A8. Special Training/Certification

Special Training / Certification information for key technical personnel is provided in Section A4. Project/Task Organization.

A9. Documents and Records

All records generated and verified by START personnel will be stored electronically on the WESTON server and backed up daily. All hard and electronic copies of finalized documents and technical project documents (including but not limited to the QAPP, health and safety plan [HASP], etc.) will be retained by WESTON in accordance with Section H.20 of Contract No.: EP-S8-13-01. Other project-related files, such as contract documents, employee benefits, and other information will be retained in accordance with WESTON Policies and Procedures. Worksheet 29 included in Attachment A provides a listing of standard project documents and records. Anticipated deliverables to be generated are identified on Worksheet 14 & 16 in Attachment A.

GROUP B: DATA GENERATION AND ACQUISITION

B1. Sampling Process Design (Experimental Design)

Design Strategy and Sample Locations

The following table lists the environmental concerns present at the Site along with the associated design strategy of assessment techniques, sample type and specific information represented (e.g., size of the area, volume, or time period to be represented), estimated total number of samples to be collected, as applicable, and designation of sample information importance in relationship to the overall investigation.

Environmental Concern	Assessment Technique	Sample Type and Representation	Total # of Samples Collected	Sample Information Designation
Landfill Material	• Geophysical Survey	Sample Type: None Representation: Presence/non-presence of anomalies potentially associated with landfilled material in the subsurface.	None	Informational
Contaminants to soil gas	• Install twelve soil gas probes • LGA screening • Grab soil gas samples at delineation locations. • Additional borings if additional delineation is needed.	Sample Type: Discrete shallow grab sample based on LGA response. Representation: Characterization of soil gas in the areas of the landfill.	To be determined based on field conditions and stakeholder requirements	Critical (screening samples are informational)
ACM	• Install six soil borings and visually inspect for suspect materials • Additional borings if delineation is needed.	Sample Type: Bulk Building Materials or soils Representation: Asbestos content of building materials	To be determined based on visual inspection of soil cuttings	Critical
Contaminants to soils	• Install six soil borings • PID and visual screening • Two grab soil samples from each boring. • Determine depth to bedrock. • Additional borings if delineation is needed.	Sample Type: Discrete shallow grab sample based on PID response, contaminant observation, or surface interval. -and- Discrete deep grab sample based on PID response, contaminant observation, 2 feet below shallow sample, or total depth/groundwater interface. Representation: Characterization of soil in the areas of the landfill.	12 (additional samples if delineation is needed)	Critical (screening samples are informational)

Environmental Concern	Assessment Technique	Sample Type and Representation	Total # of Samples Collected	Sample Information Designation
Contaminants to groundwater	• Install six soil borings. • One grab groundwater sample from each boring. • Additional borings if delineation is needed.	Sample Type: Discrete grab sample collected from one well point per borehole. Representation: Characterization of groundwater in the areas of the landfill.	6	Critical

Proposed sample areas are presented in Figure 2. Sample points may be located on a site map or with a GPS device after sample collection to be used for mapping purposes and to document sample locations selected in the field. If sampling locations become inaccessible, START will attempt to identify alternate sampling locations that provide adequate or sufficient data as the original based upon the best judgment of the project team, as necessary.

A schedule of project activities is presented in Attachment A – Worksheet 14 & 16. All samples will be submitted to the appropriate laboratory within the hold time identified on Table 1.

B2. Sampling Methods

The following sections describe the project specific field Standard Operating Procedures (SOPs) and sampling methods to be utilized during the Site investigation.

SOP Number or Reference	Title, Revision, and Date	Originating Organization
2001	General Field Sampling Guidelines, Rev. 1.0, 06/07/13	U.S. EPA - Environmental Response Team (ERT)
2007	Groundwater Well Sampling, Rev. 1.0, 06/25/15	U.S. EPA - ERT
2012	Soil Sampling, Rev. 1.0, 07/11/01	U.S. EPA - ERT
2049	Investigation-Derived Waste Management, Rev. 0.1, 10/05/15	U.S. EPA - ERT
EPA, 1985a	Asbestos Hazard Emergency Response Act (AHERA)	U.S. EPA
EPA, 1985b	"Asbestos in Buildings – Simplified Sampling Scheme for Friable Surfacing Materials"	U.S. EPA

Geophysical Survey

Geophysical Survey Method

The EM-31 survey consists of utilizing a transmitter coil mounted at one end and a receiver coil mounted at the other end of a 3.7-meter long plastic boom. Electrical conductivity and in-phase component field strength are measured and stored along with line and station numbers in a digital data logger. In-phase component measurements generally only respond to buried metallic objects; whereas conductivity measurements also respond to conductivity variations caused by changes in soil type, moisture or salinity and the presence of nonmetallic bulk wastes.

Measurement Point/Grid Surveying

A grid coordinate system of the entire area to be surveyed will be established prior to the start of geophysical surveying. The survey grid will be marked with flags for high visibility. Survey lines will be spaced 20 ft. apart.

Geophysical Data Processing

Processing will be completed to allow identification, orientation, location, and if possible, depth and shape of buried objects or trenches. Prior to processing, a quality check of the recorded data will be performed. Following quality checks, the data processing flow will first merge positioning data (grid location coordinates) to the recorded EM-31 survey measurements, if not automatically merged in the field. All processing steps (e.g., data concatenation, etc.) will be documented in the survey report.

Geophysical Data Interpretation Techniques

The final survey report will include at a minimum: a summary description of the survey performed, including any unusual and/or noteworthy findings; a procedures section with a discussion of data collection methods and grid layout; discussion of the location, and if possible, size and shape of buried accompanied by a figure depicting the findings, and a Quality Control section that includes a narrative addressing calibration frequency and background determinations of the survey area

Soil Gas Screening and Samples

Probe Installation

Twelve soil screening locations will be selected in the field, proposed locations are shown on Figure 2. Locations will be moved and additional borings (opportunity samples) added based on site conditions, access issues, and observed impacts as determined by the on-site geologist. Probe locations will be established either using a hand driven soil probe or via the Geoprobe® post run tubing direct push system. Probes will be placed approximately five feet below grade with an appropriate length of polyethylene tubing running to the surface and sealed with hydrated bentonite chips, grout, or a clay plug. Tubing will be capped, and left overnight to allow the seal to set and ambient gasses to stabilize.

Soil Screening

A landfill gas analyzer will be attached to the tubing at each soil probe location. The LGA will pump until readings stabilize indicating the probe and tubing have been purged and the reading is indicative of in situ conditions. Screening results will be recorded for informational purposes. Screening results will also guide sampling activities.

Sample Collection

A batch cleaned and certified summa canister and regulator will be attached to the tubing at the designated sample location and the valve opened. The canister and regulator id will be recorded as well as the initial and final vacuum pressures and times. The valve will be closed with a residual vacuum pressure greater than zero.

Soil Samples

Soil Boring

Six soil boring locations will be selected in the field, based on soil vapor screening, proposed locations are shown on Figure 2. Soil boring locations will be moved and additional borings (opportunity samples) added based on site conditions, access issues, and observed impacts as determined by the on-site geologist. Soil samples will be collected during soil drilling via the Geoprobe® Dual Tube direct push system. Soil borings will be advanced to the soil/groundwater interface. Additional soil borings will be advance to bedrock in order to determine the depth to bedrock.

Soil Screening

Soil cuttings recovered from the borehole will be field screened for impacts using a PID to measure relative concentrations of organic vapors and by visual inspection. PID measurements will be made by placing a representative volume of soil cuttings from each two-foot interval in a zip top plastic bag, pressing most of the air out of the bag and sealing the bag, and inserting the PID intake probe into the plastic bag after allowing an amount of time for the vapors to equilibrate within the bag. Effort will be made to place a similar volume of soil and air in each screening sample bag and to allow a similar amount of time to pass prior to each screening. Screening results will be recorded for informational purposes. Screening results will also guide sampling activities.

Sample Collection

One shallow soil sample will be collected from each boring based on the following criteria:

- Depth interval with the greatest PID response;
- Depth interval with soil staining or other signs of impacts based on visual inspection; or,
- From the surface soil interval (0-2 feet bgs), if no elevated PID readings or staining is observed.

A second sample will be collected from each boring based on the following criteria:

- "Clean" soil below apparently impacted soil (based on field screening);
- Depth interval greater than 2 feet below the first sample (if apparent impacts persist based on field screening); or,
- From the groundwater/soil interface or total depth, whichever is applicable (if no elevated PID readings or staining is observed).

Each discrete grab sample will be collected by donning a new pair of nitrile gloves and placing soil from the selected interval directly into laboratory provided glassware (volumes and types outlined in Table 1) using the gloved hand or a disposable or decontaminated scoop. If laboratory analysis requires sample collection via EPA method 5035 a disposable plunger designed to collect between 5 and 10 grams of soil will be pressed into the sample interval, any soil beyond the mouth of the plunger will be removed, and the remaining soil plug will be pressed into laboratory provided glassware.

Groundwater Samples

Well Point Boring

If groundwater is not encountered in the soil borings previously described a Geoprobe® well point will be advanced to a depth determined by site conditions. Upon withdrawal of four feet of the push rods a stainless-steel screen will be exposed at the bottom of the boring allowing for the inflow of groundwater, if present.

Collection Methods

If possible the depth to groundwater (dtw) bgs will be measured prior to disturbance of the water column.

Water will be extracted to the surface using a peristaltic pump (dtw <25 feet bgs), a decontaminated pneumatic bladder pump or electric impeller pump (dtw >25 feet bgs and well/boring diameter >2 inches), or disposable bailer or check ball tubing (dtw >25 feet bgs and well/boring diameter <2 inches), dependent upon the dtw and diameter of boring or well. When using the listed pumps low flow sampling methods will be used (described as follows). If the water column pumps dry or if using the bailer or check ball methods a direct grab sample will be collected by first donning a new pair of nitrile gloves and adding the water directly to the laboratory provided sample containers (volumes and types outlined in Table 1). If laboratory analysis requires sample collection for dissolved phase compounds the water will be pumped either directly from the well or boring or from a disposable laboratory provided glassware through a 0.45 micrometer filter into the final laboratory provided glassware. All glassware will have method appropriate preservative either premeasured in each container or added as needed by field sampling personnel.

The low flow sampling procedure is designed to minimize water column drawdown and thereby ensure a more representative sample from the ambient aquifer conditions outside of the boring or well.

- Water is pumped at a rate of less than 0.5 liters per minute into a water quality meter used to record screening parameters such as temperature, pH, dissolved oxygen, and conductivity.
- Screening parameters should be recorded at intervals sufficient to purge the monitoring system (e.g. if the water quality meter container is 0.5 liters and the flow rate is 0.25 liters per minute screening parameters should be recorded every 2 minutes).
- The water column is ready for sampling when pH, dissolved oxygen, and conductivity are within 10% for at least 3 consecutive readings.

Asbestos Survey

ACM Survey Methods

Visual inspections will be performed of the soil cuttings to determine if any suspect building materials are present. Each material will be touched to determine if it is friable.

Collection Methods

Each ACM sample will be collected by donning a new pair of nitrile gloves and placing material from the soil cutting directly into a plastic bag using the gloved hand. If material is too pulverized or inseparable, a soil sample will be collected instead.

Sample Nomenclature

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. A unique, identifiable name will be assigned to each sample to allow retrieval and sample cross-referencing. The sample ID will be composed of the following components:

PB	**-**	**XX**	**-**	##	**-**	##	**-**	##
Site ID		Media ID		Sample ID		Start Depth		End Depth

1) Site Identifier: PB = Place Bridge.
2) Defines sample type:
   BH = Bore Hole Sample
   GW = Groundwater Sample
   SG = Soil Gas
   ACM variation = Homogeneous material type ID and a two-digit homogeneous material number (e.g. first drywall homogeneous area [DW01]) or use BH of a soil sample
   TB/EB = Trip Blank/Equipment Blank [Blank samples will forgo sample ID components 3-5 and instead be given a date identifier for the day they were collected (e.g. a trip blank made on May 1, 2018 would be PB-TB-050118)
3) Sample Identifier: Sample ID for each borehole or groundwater boring/well (the sequential order of the borehole). Duplicate samples will receive a sample ID starting with 9 and the second number corresponding to the parent sample ID (e.g. PB-BH-91-05-06 is the duplicate of PB-BH-01-05-06).
4) First two digits indicate the depth at the top of the sample interval in feet (not applicable to ACM samples unless a soil sample is collected).
5) Last two digits indicate the depth at the bottom of the soil sample core in feet (not applicable to ACM samples unless a soil sample is collected).

An example of a sample number is PB-BH-01-04-06. This identifies the sample as the 4-6-foot interval (04-06) borehole soil sample (BH) taken from BH-01 (01) at the Place Bridge (PB) site.

Samples will be recorded in a logbook and located on a site map. If site conditions warrant the modification of nomenclature, this change will be documented in the logbook.

Samples will be analyzed for the parameters listed in Table 1 and listed in Worksheet 15. Requirements for the sample container, volume, preservation, and quality control (QC) samples are also listed in Table 1. In addition, requirements for the sample container, volume, preservation, and QC samples are listed on Worksheet 19 & 30 of the QAPP.

B3. Sample Handling and Custody

Soil Gas Samples

Soil gas samples will be transferred into laboratory-supplied summa canisters for laboratory analysis. Disposable gloves will be used during sample collection procedures. The soil gas sample containers will be labeled and stored under proper chain of custody procedures until shipment for laboratory analysis accompanied by chain-of-custody documentation.

Soil Samples

Soil samples will be transferred into laboratory-supplied containers for laboratory analysis. Disposable gloves will be used during sample collection procedures. The soil sample containers will be labeled, placed in a cooler with ice [cooled to 4 degrees Celsius (°C)], and stored under proper chain of custody procedures until shipment for laboratory analysis accompanied by chain-of-custody documentation.

Groundwater Samples

Groundwater samples will be transferred into laboratory-supplied containers in a manor limiting the agitation of the water to prevent the addition of air into the sample. Disposable gloves will be used during sample collection procedures. The groundwater sample containers will be labeled, preserved with the required solutions (HCl, HNO_3, etc.), placed in a cooler with ice (cooled to 4°C), and stored under proper chain of custody procedures until shipment for laboratory analysis accompanied by chain-of-custody documentation.

Asbestos Samples

Personnel performing sample collection will use personal protective equipment (PPE) appropriate to the hazard(s) presented and may include gloves, Tyvek, booties, hard hats, and/or HEPA respiratory protection. Sample locations will be recorded in a logbook. Samples will be double-bagged, labeled, and stored until shipment/delivery for laboratory analysis accompanied by chain-of-custody documentation. All suspect friable and non-friable ACM will have a bulk or soil sample collected for submission to a laboratory certified by the National Voluntary Laboratory Accreditation Program (NVLAP) for asbestos analyses.

B4. Analytical Methods

The following table lists the analytical parameters and primary COCs commonly associated with the concerns identified at the Site.

Sample Media	Analytical Parameters (Analytical Method)	Primary Contaminants of Concern	Project Action Level (parts per million or as noted)
Soil Gas	Methane (EPA Method 3C or laboratory specified alternative)	Methane	5 %
	VOCs (Method TO-15)	Benzene	12 micrograms per cubic meter (ug/m^3)
		Ethylbenzene	37 ug/m^3
		Toluene	170000 ug/m^3
		Xylenes	3500 ug/m^3
		Naphthalene	2.8 ug/m^3
Soils	SVOCs	Benzo(a)pyrene	0.11
		Benzo(b)fluoranthene	1.1

Sample Media	Analytical Parameters (Analytical Method)	Primary Contaminants of Concern	Project Action Level (parts per million or as noted)
	(EPA Method 8270)	Chrysene	110
		Fluoranthene	2400
		Pyrene	1800
	VOCs (EPA Method 8260)	Benzene	0.17
		Ethylbenzene	5.8
		Toluene	50
		Xylenes	75
		Naphthalene	3.8
	Metals (EPA Method 6010/6020 and 7471)	Cadmium	71
		Chromium	120000
		Lead	400
Groundwater	VOCs (EPA Method 8260)	Benzene	0.00046
		Ethylbenzene	0.0015
		Toluene	0.56
		Xylenes	0.19
		Methyl tert-Butyl Ether	0.0014
		Naphthalene	0.00017
		Trichloroethene	0.00049
		Tetrachloroethene	0.011
	SVOCs (EPA Method 8270)	Benzo(a)pyrene	0.0000048
		Benzo(b)fluoranthene	0.0000048
		Chrysene	0.0000048
		Fluoranthene	0.28
		Pyrene	0.12
	Metals (EPA Method 6010/6020 and 7470)	Cadmium	0.0092
		Chromium	22
		Lead	0.015
Building Materials	Asbestos (PLM Bulk and Point Count by EPA Method 600/R-93/116)	Chrysotile	1%
		Amosite	1%
		Actinolite/Tremolite	1%

A complete list of analytes for the analytical methods along with project quantitation limits (PQLs), laboratory quantitation limits (LQLs), and laboratory detection limits (LDLs) is presented on Worksheet 15 included in Attachment A. A comprehensive summary of sample analytical parameters, methods, containers, preservation requirements, QA/QC samples, and holding times is present in Table 1.

Investigative-derived Waste Management

Investigation-derived waste (IDW) will be managed in accordance with ERT SOP #2049 Investigation-Derived Waste Management. IDW anticipated to be generated during the investigation includes excess sample volume, disposable sampling equipment, and used PPE.

The U.S. EPA does not recommend the removal of wastes from all sites and, in particular, from those sites where IDW does not pose any immediate threat to human health or the environment (ERT SOP #2049). This includes leaving on-site Comprehensive Environmental Response, Compensation, and Liability Act and/or Resource Conservation and Recovery Act non-hazardous soil cuttings, groundwater, and decontamination fluids preferably without containerization and testing. It is not anticipated that any wastes generated will require off-site disposal or long-term aboveground containerization. IDW generated will be returned to the area of concern (AOC) location where collected or containerized and properly labeled, if considered potentially hazardous. Per ERT SOP #2049, the on-site handling options for non-hazardous IDW are listed below.

For excess soils/soil cuttings:

1. Spread around the excavation.
2. Put back into the excavation.
3. Put into a pit within the AOC.

For groundwater:

1. Pour onto ground next to AOC to allow infiltration.

For decontamination fluids:

1. Pour onto ground (from containers) to allow infiltration.

For decontaminated PPE and disposable equipment:

1. Double bag and deposit in the site or U.S. EPA dumpster, or in any municipal landfill.

If field screening indicates the potential for the presence of COCs at concentrations above the screening levels, potentially impacted IDW will be containerized on-site for characterization and proper disposal.

B5. Quality Control

The following table indicates the frequency of quality control activities for the project.

Quality Control Activity	Frequency
Field Duplicates	1 per 10
Matrix Spike/Matrix Spike Duplicates (MS/MSD)	1 per 20
Field Blanks	1 per day (if needed)
Equip. Blanks	1 per day (if needed)
Trip Blanks	1 per cooler (or as needed)

Quality Control Activity	Frequency
Asbestos Duplicates	1 per 20

Additional information regarding project-specific QC samples and proficiency testing samples is presented in Table 1 and Worksheet 12 in Attachment A.

B6. Instrument/Equipment Testing, Inspection, and Maintenance

START field personnel are responsible for the calibration of WESTON field equipment and field equipment provided by subcontractors. Documented and approved procedures will be used for calibrating measuring and testing equipment. Widely accepted procedures, such as those published by U.S. EPA and ASTM, or procedures provided by manufacturers in equipment manuals will be adopted. Information regarding specific equipment is included on Worksheet 22, 24, & 25 in Attachment A.

B7. Instrument/Equipment Calibration and Frequency

Instrument/Equipment calibration and frequency information is provided on Worksheet 22, 24, & 25 in Attachment A.

B8. Inspection/Acceptance of Supplies and Consumables

Supplies and consumables utilized for sample handling, custody and disposal are identified on Worksheet 26 & 27 included in Attachment A.

B9. Non-direct Measurements

Sources and types of secondary data useful for this project include but are not limited to the following:

- Historical Records
- Previous Investigations
- Regulatory Agency Files
- Topographic maps
- Historical Aerial Photographs
- Visual Site Reconnaissance
- Interviews

The project team will carefully evaluate the quality of secondary data to ensure they are of the type and quality necessary to support their intended uses. When evaluating the reliability of secondary data and determining limitations on their uses, the project team will consider the source of the data, the time period during which they were collected, data collection methods, potential sources of uncertainty, the type of supporting documentation available, and the comparability of data collection methods to the currently proposed methods. With respect to secondary analytical data

that will be utilized to support critical decisions, such as comparison of contaminant levels with applicable standards, a detailed review of the data will be necessary to determine the usability of the data. Worksheet 13 in Attachment A provides details on the secondary data review process to be completed in accordance with EPA guidelines.

B10. Data Management

Field data will be recorded in the field logbook, field map(s), and or GPS. Proper chain-of-custody procedures will be utilized for documenting and tracking analytical samples. All data will be captured in the project files for use in analysis and reporting. Other than chain-of-custody forms, no specific checklists or forms are required for this project. Attachment A includes Project documentation details on Worksheet 29 and Data Verification methods on Worksheet 35.

GROUP C: ASSESSMENT AND OVERSIGHT

C1. Assessments and Response Actions

Worksheet 31, 32, & 33 details the types of assessments, response actions and responsible parties. All reports will be prepared by START and distributed to the following to include but not be limited to the START PM, Program Manager and Delegated QA Manager, and the U.S. EPA COR, WAM, and/or DAO as applicable.

C2. Reports to Management

Reports to management include, but are not limited to, the following:

- Field audit
- Laboratory audit
- Field activities summary
- Project status calls/meetings
- Data validation report
- Data usability report

GROUP D: DATA VALIDATION AND USABILITY

D1. Data Review, Verification, and Validation

The following general steps will be followed to conduct a data usability assessment, which evaluates whether underlying assumptions used during systematic planning are supported, sources of uncertainty have been accounted for and are acceptable, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence:

- Step 1 – Review the project's objectives and sampling design.
- Step 2 – Review the data verification and data validation outputs.
- Step 3 – Verify the assumptions of the selected statistical method (if applicable)

- Step 4 – Implement the statistical method (if applicable).
- Step 5 – Document data usability and draw conclusions.

The data usability assessment is considered the final step in the data evaluation process. All data will be assessed for usability, regardless of the data evaluation/validation process implementation.

D2. Verification and Validation Methods

Data verification procedures are described on Worksheet 35 in Attachment A. Data validation procedures are described on Worksheet 36 in Attachment A.

D3. Reconciliation with User Requirements

For issues internal to the laboratory, the laboratory PM will be the responsible party for data resolution issues and will be responsible for conveying this information to the Delegated QA Manager or delegated authority. For external laboratory data and quality issues, the Delegated QA Manager or delegated authority will provide issue resolution information and will be the responsible party for conveying this information to data users. For quality documents, reports, and field information, the Delegated QA Manager, delegated authority, or other persons identified in the project team will be responsible for issue resolution of such items and will be the responsible party for conveying that information to data users.

REFERENCES

ASTM, 2011. E1903-11, *Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process.* West Conshohocken, Pennsylvania.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
ASTM, 2011	Guidance	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

CDPHE, *Regulation NO. 41 – The Basic Standards for Groundwater*. December 2016.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
CDPHE, 2016	Guidance	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

CDPHE, *Groundwater Protection Values Soil Cleanup Table*. March 2014.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
CDPHE, 2014	Guidance	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

EPA, *Regional Screening Levels (RSLs) – Generic Tables (November 2017)*. November 2017

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
EPA, 2017	Guidance	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

EPA, 2018. *TDD 0003/1804-06 "Place Bridge Elementary School"*. April 2018.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
EPA, 2018	Guidance	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

EPA, EPA's "Pink Book", *Asbestos in Buildings: Simplified Sampling Scheme for Friable Surfacing Materials*. (EPA 560/5-85-030a). October 1985

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
EPA, 1985	Guidance	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

WESTON. *Phase I ESA for Place Bridge Elementary 1400 South Oneida Street Denver, Denver County, Colorado*. June 2018.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
WESTON, 2018	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

TABLES

Table 1 - Sampling and Analysis Summary

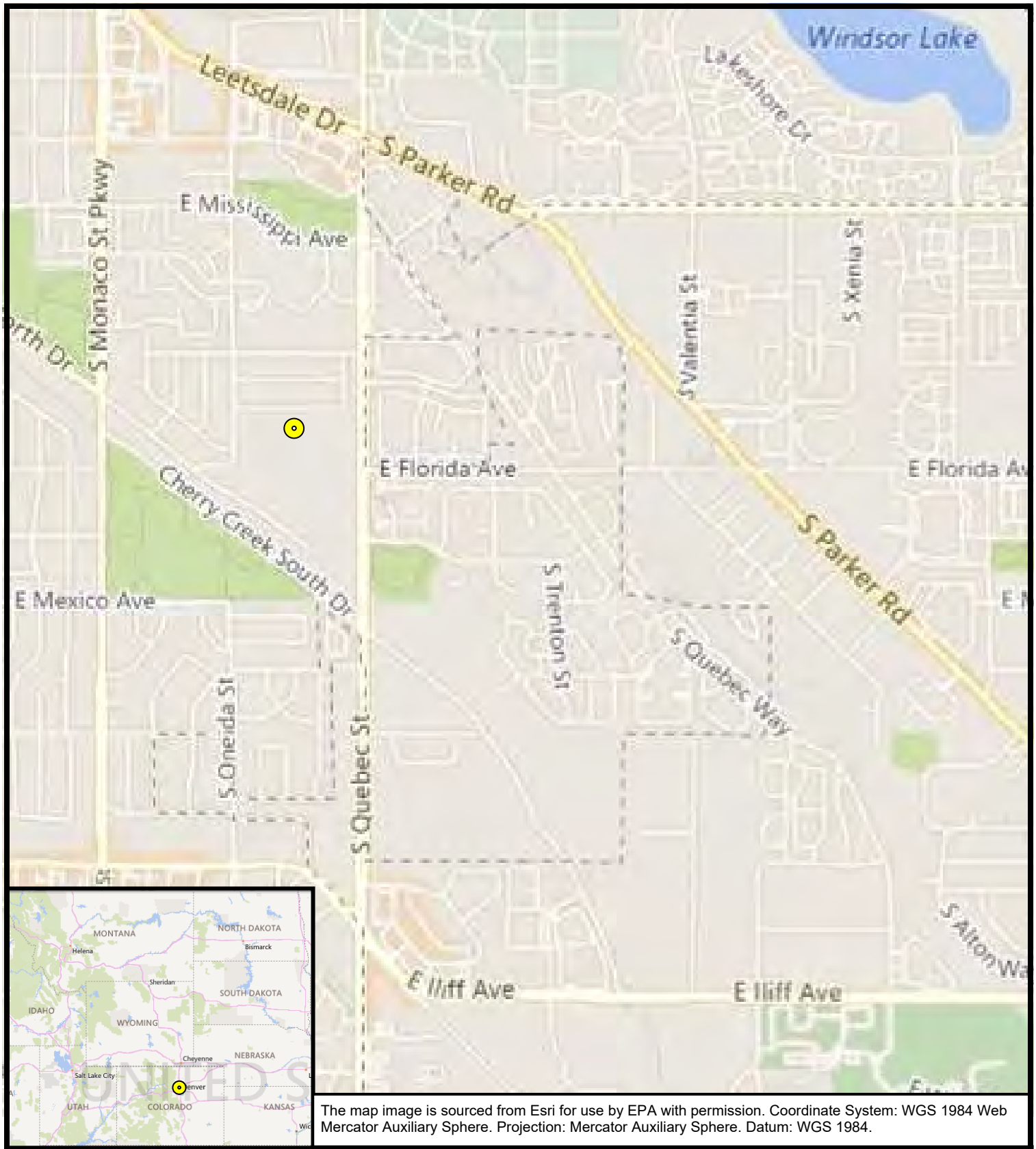
Area of Concern (AOC)/ Matrix	Analytical Parameter / Method	Containers (Numbers, Size, Type, and Preservation)	Number of Sampling Locations	Number of Field Duplicates / and MS/MSDs	Number of Blanks[1]	Total Number of Samples to Lab[2]	Holding Time	Sample ID / Sampling Note
Building Materials or Soil	ACM / EPA 600/R-93/116	One sandwich size sealable plastic bag (double bagged). No preservation requirements.	Unknown (To be determined during survey)	N/A	N/A	Unknown (To be determined during survey)	N/A	PB-XX##-## PB-[Material Type][Material Number]-[Sample Number] or PB-BH-##-##-## PB-BH-[Sequential Sample Number]-[Start Depth]-[End Depth]
All AOCs / Soil Gas	Methane / EPA 3C or equivalent VOCs / TO-15	One summa canister	Unknown (To be determined during survey)	N/A	N/A	Unknown (To be determined during survey)	N/A	PB-SG-##-##-## PB-BH-[Sequential Sample Number]-[Start Depth]-[End Depth]
All AOCs / Soil	VOCs / EPA 8260; SVOCs / EPA 8270; and RCRA metals / EPA 6010, 6020, and 7471	2-8oz glass jars. Cool to 4° Celsius	12	2 / 1	0	14	14 days	PB-BH-##-##-## PB-BH-[Sequential Sample Number]-[Start Depth]-[End Depth]
All AOCs / Water	VOCs / EPA 8260; SVOCs / EPA 8270; and RCRA metals (total and dissolved) / EPA 6010, 6020, and 7470	3-40 ml glass vials w/ HCl; 1-1 l glass jar w/ HCl; 1-1 l glass jar unpreserved; and, 1-250 ml plastic bottle w/ HNO_3. Cool to 4° Celsius	6 3 additional	1 / 1 1 / 1 additional	1 Trip Blank (VOC only)	7 + trip blank for VOC only 4 additional	14 days	PB-GW-01-##-##; PB-GW-[Sequential Sample Number]-[Start Depth]-[End Depth]

Notes:

[1] Blanks include trip, equipment, and field.

[2] Total number of samples to the laboratory does not include MS/MSD samples.

FIGURES



The map image is sourced from Esri for use by EPA with permission. Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere. Projection: Mercator Auxiliary Sphere. Datum: WGS 1984.

Legend

Site Location

0 650 1,300 feet

N

Prepared for:
U.S. EPA Region 8

Contract No.:
EP-S8-13-01

TDD:
1804-06

TO:
0003

Prepared By:
Weston Solutions, Inc.
START IV

Suite 100
1435 Garrison Street
Lakewood, CO 80215

FIGURE 1

SITE LOCATION MAP

PLACE BRIDGE ELEMENTARY

1400 SOUTH ONEIDA STREET
DENVER, DENVER COUNTY, COLORADO

DATE: 5/25/2018

The map image is sourced from Esri for use by EPA with permission. Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere. Projection: Mercator Auxiliary Sphere. Datum: WGS 1984.

Legend

- Geophysical Survey Boundary
- Proposed Soil Gas Probe Location
- Proposed Soil and Groundwater Sample Location
- Proposed Supplemental Groundwater Sample Locations

0 150 300 feet

N

Prepared for:
U.S. EPA Region 8

Contract No.:
EP-S8-13-01

TDD:
1804-06

TO:
0003

Prepared By:
Weston Solutions, Inc.
START IV

Suite 100
1435 Garrison Street
Lakewood, CO 80215

FIGURE 2

SAMPLE LOCATION MAP

PLACE BRIDGE ELEMENTARY

1400 SOUTH ONEIDA STREET
DENVER, DENVER COUNTY, COLORADO

DATE: 11/16/2018

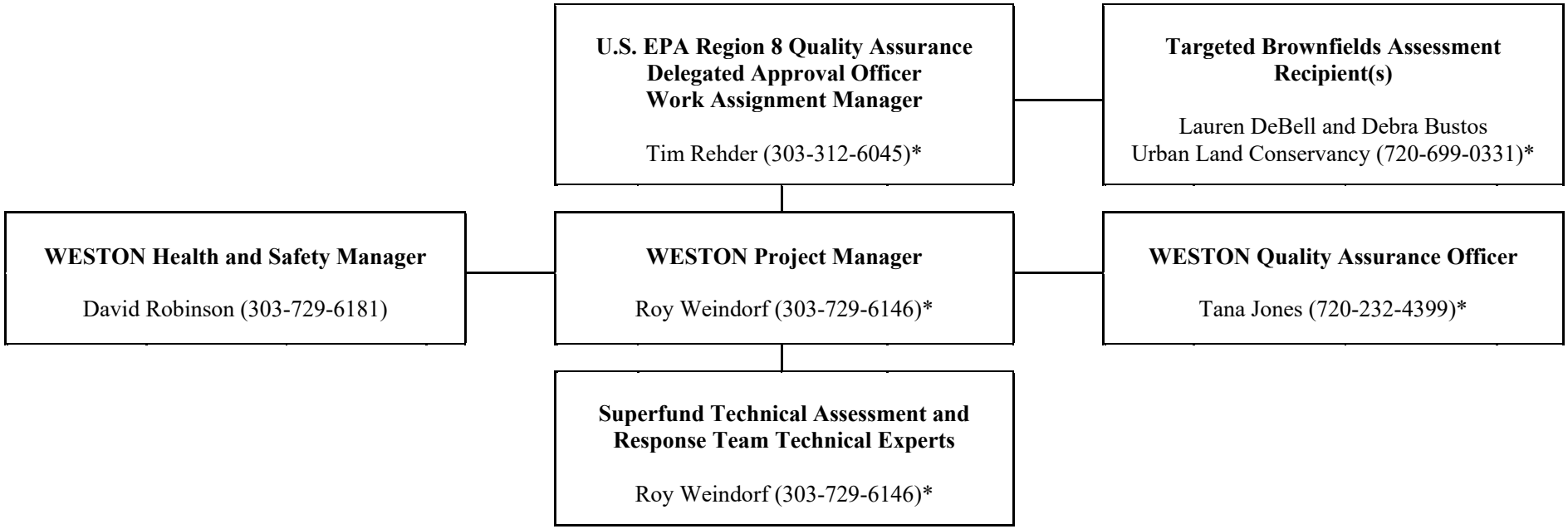
ATTACHMENTS

ATTACHMENT A
SUPPORTING UFP-QAPP WORKSHEETS

Worksheet 3 & 5 — Project Organization and QAPP Distribution

(UFP-QAPP Manual Section 2.3 and 2.4)
(EPA 2106-G-05 Section 2.2.3 and 2.2.4)

Project SAP Organization and Distribution



* = receive copy of Project SAP

Worksheet 12 — Measurement Performance Criteria Tables

(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

The following information is project-specific and will be provided for each matrix, analytical group or analytical method, and concentration level (if applicable) and will be included in the site-specific FSP, SAP, and/or QAPP. The following are examples for Organics and Inorganics for all media, and particulates, fibers, and biologicals.

Worksheet 12.1 — Measurement Performance Criteria - Organics

Matrix: All
Analytical Group or Method: Organics
Concentration Level: All

Data Quality Indicator (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria (MPC)
Field Precision	Field Duplicate	1 per 10 samples relative percent difference (RPD) determined on a sampling method-specific basis
Field Representativeness/ Accuracy/Bias	Equipment Rinsate Blank	1 per 20 samples/matrix or 1 per day <½ Reporting Limit (limit of quantitation [LOQ])
Accuracy/Bias	Trip Blanks	<½ LOQ
Accuracy/ Precision	Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One set per extraction batch when sufficient sample volume is provided or as requested per client Analyte-specific
Laboratory Precision	Laboratory Duplicate	1 per 20 samples per matrix Analyte-specific
Accuracy/Precision	High Calibration Standard	All analytes within ±15% of expected value
Accuracy/Precision	Initial Calibration	Five-point calibration for all analytes prior to sample analysis. Mean relative standard deviation (RSD) for all analytes < 20% Correlation Coefficient R ≥ 0.995
Accuracy/Bias	Initial Calibration Verification	After each initial calibration Within ±20% of expected value
Precision	Continuing Calibration Verification	After every 20 samples and at end of sequence All analytes within ±20% of expected value
Accuracy/Bias	Surrogate	Every sample <½ LOQ. Project and method-specific
Laboratory Representativeness/ Accuracy/Bias	Method Blank	1 per batch per matrix or 1 per 20 samples, whichever is more frequent <½ LOQ
Laboratory Accuracy/Sensitivity	Laboratory Control Sample (LCS)	1 per batch per matrix or 1 per 20 samples, whichever is more frequent No analyte ≥ LOQ

Worksheet 12.2 — Measurement Performance Criteria - Inorganics

Matrix: All
Analytical Group or Method: Inorganics
Concentration Level: All

DQI	QC Sample or Measurement Performance Activity	MPC
Field Precision	Field Duplicate	1 per 10 samples RPD determined on a sampling method-specific basis
Field Representativeness/ Accuracy/Bias	Equipment Rinsate Blank	1 per 20 samples/matrix or 1 per day <½ LOQ
Accuracy/Bias	MS/MSD	1 per 20 samples per matrix RPD <20%
Laboratory Precision	Laboratory Duplicate	1 per 20 samples per matrix RPD <20%
Accuracy/Precision	Initial Calibration	Daily prior to sample analysis (minimum 1 standard and a blank)
Accuracy/Bias	Initial Calibration Verification	Daily after initial calibration All analytes within ±10% of expected value
Accuracy/Bias	Calibration Blank (CB) Initial Calibration Blank/Continuing Calibration Blank (ICB/CCB)	After every calibration/verification No analytes detected ≥ Limit of Detection (LOD)
Precision/Accuracy	Calibration Verification (Instrument Check Standard)	At beginning of analytical sequence, after every 10 samples and at the end of the analysis sequence All analytes within ±10% of expected value and RSD of replicate integrations <5%
Precision	Interference Check Solution	At beginning of analytical run ± 20% of the expected value
Precision/Accuracy	Serial Dilution	Method-specific
Accuracy/Bias	Post Digestion Blank	Each digestion batch %R. Analyte-specific
Laboratory Representativeness/ Accuracy/Bias	Method Blank	1 per batch per matrix or 1 per 20 samples, whichever is more frequent No analyte ≥ Reporting Limit (RL)
Laboratory Accuracy/ Sensitivity	LCS	1 per batch per matrix or 1 per 20 samples, whichever is more frequent No analyte ≥ LOQ

Worksheet 12.3 — Measurement Performance Criteria – Fibers

Matrix: All
Analytical Group or Method: Fibers
Concentration Level: All

DQI	QC Sample or Measurement Performance Activity	MPC
Field Precision	Field Duplicate	1 per 10 samples RPD determined on a sampling method-specific basis
Field Representativeness/ Accuracy/Bias	Field Blank	1 per 20 samples per matrix No fiber counts yielding greater than 7 fibers per 100 graticule fields (phase contrast microscopy [PCM])
Laboratory Precision	Laboratory Replicate Fiber Count	1 per day per matrix per analyst Laboratory obtained RSD for each sample matrix analyzed in each of the following ranges: 5 to 20 fibers in 100 graticule fields, >20 to 50 fibers in 100 graticule fields, and >50 to 100 fibers in 100 graticule fields not exceeded (PCM)
Laboratory Accuracy/Bias	Blind Recounts	On 10% of filters counted Absolute value of the difference between the square roots of the two fiber counts (in fiber/mm^2) < 2.77(average of the square roots of the two fiber counts) (intracounter relative standard deviation for the appropriate count range/2) (PCM)
Accuracy/Precision	Initial Calibration	Daily prior to sample analysis Phase rings are concentric (PCM). True magnification calculated and reference selected area electron diffraction, microdiffraction patterns, pattern visibility, and energy-dispersive X-ray (EDX) spectra obtained (transmission electron microscopy [TEM]).
Accuracy/Bias	Initial Calibration Verification	Daily after initial calibration and for each analyst/microscope combination All grooved lines in each block of the test slide resolve appropriately (PCM).

Worksheet 12.4 — Measurement Performance Criteria – Particulates and Biologicals

Matrix: All
Analytical Group or Method: Particulates and Biologicals
Concentration Level: All

DQI	QC Sample or Measurement Performance Activity	MPC
Field Precision	Field Duplicate	1 per 10 samples RPD determined on a sampling method-specific basis
Field Representativeness/ Accuracy/Bias	Field Blank	1 per 20 samples/matrix or 1 per day <½ LOQ

Worksheet 13 — Secondary Data Uses and Limitations

(UFP-QAPP Manual Section 2.7)
(EPA 2106-G-05 Chapter 3: QAPP Elements for Evaluating Existing Data)

Sources and types of secondary data include but are not limited to the following:

Data Type	Data Source (originating organization, report title and date)	Data Uses Relative to Current Project	Factors Affecting the Reliability of Data and Limitations on Data Use
Soils	United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Web Soil Survey and Soil Data Mart	Identify soil types, composition, elevation, precipitation, setting, properties and qualities, profile, land capability and farmland classification	Project-Specific
Geology/Hydrology	United States Department of the Interior Geologic Survey (USGS) Topographic and Geologic Maps, State Agencies/EPA My WATERS Mapper	Identify area Geology, topography, surface water bodies, hydrologic units/watersheds, water quality, etc.	Project-Specific
Streams/Drainages	EPA My WATERS Mapper and USGS Topographic Maps	Topography, surface water bodies, hydrologic units/watersheds, water quality, etc.	Project-Specific
Registered Wells	State Databases	Identify well locations, drinking water wells, and groundwater use	Project-Specific
Meteorological	National Weather Service	Seasonal fluctuations in storm water runoff	Project-Specific
Property Boundaries	County Assessor and Plat Maps	Identify property boundaries to determine site requirements for assessment	Project-Specific
Environmentally Sensitive Areas	U.S. and State Fish & Wildlife Service Maps, Publications, and Databases	Identify sensitive and endangered species and environments potentially present on or in site assessment area	Project-Specific
Wetlands	USDA NRCS Web Soil Survey and Soil Data Mart (Hydric Soils List), and U.S. and State Fish & Wildlife Databases	Identify wetlands and associated sensitive and endangered species and environments potentially present on or in site assessment area	Project-Specific
Historical and Current Site Use and Investigations	Historical Records, Previous Investigations, Regulatory Agency Files, Historical Aerial Photographs, Visual Site Reconnaissance, and Interviews	Supplemental background information on historical site use and current site conditions, and previous investigations	Project-Specific

The project team will carefully evaluate the quality of secondary data (in terms of precision, bias, representativeness, comparability, and completeness) to ensure they are of the type and quality necessary to support their intended uses. When evaluating the reliability of secondary data and determining limitations on their uses, the project team will consider the source of the data, the time period during which they were collected, data collection methods, potential sources of uncertainty, the type of supporting documentation available, and

the comparability of data collection methods to the currently proposed methods. With respect to secondary analytical data that will be utilized to support critical decisions, such as comparison of contaminant levels with applicable standards, a detailed review of the data will be necessary to determine the usability of the data. In addition to the qualitative rating of the data source, the project team should complete a data quality review and document the review in a data usability summary. The protocol for completing the data usability report is provided in Worksheet 37.

In accordance with EPA guidance documents *A Summary of General Assessment Factors for Evaluating the Quality of Scientific and Technical Information* (June 2003) and subsequent addendum *Guidance for Evaluating and Documenting the Quality of Existing Scientific and Technical Information* (December 2012) (Appendix E), the following assessment factors will be utilized to assess the quality and relevance of scientific and technical information:

1. **Soundness** – the extent to which the scientific and technical procedures, measures, methods or models employed to generate the information are reasonable for, and consistent with, the intended application.
2. **Applicability and Utility** – the extent to which the information is relevant for the Agency's intended use.
3. **Clarity and Completeness** – the degree of clarity and completeness with which the data, assumptions, methods, quality assurance, sponsoring organizations and analyses employed to generate the information are documented.
4. **Uncertainty and Variability** – the extent to which the variability and uncertainty (quantitative and qualitative) in the information or in the procedures, measures, methods or models are evaluated and characterized.
5. **Evaluation and Review** – the extent of independent verification, validation and peer review of the information or of the procedures, measures, methods or models.

Use of secondary data will be evaluated as part of Phase I and Phase II ESAs. The type of information, sources of information and quantity of information will be project-specific. The following table can be utilized and/or modified as appropriate in the development of the site-specific FSP, SAP, and/or QAPP, and site report to capture the review of the secondary data assessment factors. Assessment factors will be rated as Acceptable, Marginal, Unacceptable, Not Applicable, or Indeterminate.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review

Worksheet 14 & 16 —Project Tasks & Schedule

(UFP-QAPP Manual Section 2.8.2)
(EPA 2106-G-05 Section 2.2.4)

Activity	Responsible Party	Planned Start Date	Planned Completion Date	Deliverable(s)	Deliverable Due Date
Develop a Draft SAP and the U.S. EPA Region 8 QA Document Review Crosswalk	START	6/21/2018	6/28/2018	Draft SAP and the Draft U.S. EPA Region 8 QA Document Review Crosswalk	6/28/2018
U.S. EPA and TBA Recipient Review of Draft SAP	U.S. EPA and TBA Recipient	6/28/2018 or upon receipt	7/9/2018 or five business days after receipt	Comments on Draft SAP	N/A
Address Comments/Develop Final SAP and U.S. EPA Region 8 QA Document Review Crosswalk	START	7/9/2018 or upon receipt	7/16/2018 or five business days after receipt	SAP and the Final U.S. EPA Region 8 QA Document Review Crosswalk	7/16/2018
Develop Health and Safety Plan (HASP)	START	7/29/2018	7/18/2018	HASP	N/A
Mobilization / Demobilization	START	7/19/2018	7/25/2018	N/A	N/A
Field Activities	START	7/19/2018	7/25/2018	Field Notes/Activity Updates	N/A
Analytical Tasks	START	7/26/2018	8/8/2018 or ten business days after receipt of samples	Field Notes/Laboratory Reports	N/A
Data Verification and Validation	START	8/9/2018 or upon receipt	8/22/2018 or ten business days after receipt	Verification and Validation Summary included in Phase II ESA	N/A
Email Summary and/or Conference Call to Discuss Preliminary Results to Support TBA Stakeholders Planning (if requested)	START, U.S. EPA and TBA Stakeholders	To be determined, if requested	To be determined, if requested	Conference Call (if requested)	N/A
Develop Draft Phase II ESA with Cost Estimates for Cleanup Report	START	7/26/2018	8/22/2018 or ten business days from receipt of lab data	Draft report	8/22/2018

Activity	Responsible Party	Planned Start Date	Planned Completion Date	Deliverable(s)	Deliverable Due Date
U.S. EPA and TBA Stakeholder Review of Draft Phase II ESA with Cost Estimates for Cleanup Report	U.S. EPA and TBA Stakeholders	8/22/2018 or upon receipt	8/29/2018 or five business days from receipt	Comments on Draft report	N/A
Address comments / Develop Final Phase II ESA with Cost Estimates for Cleanup Report	START	8/29/2018 or upon receipt	9/6/2018 or five business days from receipt	Final report	9/6/2018
Mobilization / Demobilization	START	12/17/2018	12/17/2018	N/A	N/A
Field Activities	START	12/17/2018	12/17/2018	Field Notes/Activity Updates	N/A
Analytical Tasks	START	12/18/2018	1/3/2019 or ten business days after receipt of samples	Field Notes/Laboratory Reports	N/A
Data Verification and Validation	START	1/4/2019 or upon receipt	1/18/2019 or ten business days after receipt	Verification and Validation Summary included in Phase II ESA	N/A
Develop Draft Phase II ESA Addendum	START	12/18/2018	1/18/2019 or ten business days from receipt of lab data	Draft report	1/18/2019
U.S. EPA and TBA Stakeholder Review of Draft Phase II ESA Addendum	U.S. EPA and TBA Stakeholders	1/21/2019 or upon receipt	1/25/2019 or five business days from receipt	Comments on Draft report	N/A
Address comments / Develop Final Phase II ESA with Cost Estimates for Cleanup Report	START	1/28/2019 or upon receipt	2/1/2019 or five business days from receipt	Final report	2/1/2019
Submit Property Profile Form	START	1/18/2019 or upon completion of draft report	2/1/2019 or after submittal of final report	Property Profile Form	2/1/2019

Notes: All dates presented in the table are planned dates and are subject to change given uncertainties such as inclement weather, laboratory reporting, etc. that can affect actual completion of the tasks described.

Site access agreements will be managed by the U.S. EPA WAM.

Laboratory analytical services will be provided by a subcontracted laboratory. Laboratory result turnaround time (TAT) will be standard 10 business days.

All analytical data will undergo verification and validation by START as described in QAPP Worksheets 34-37.

Reports to management will be written and distributed in accordance with the QAPP Worksheet 6.

Worksheet 15 — Project Action Limits and Laboratory-Specific Detection/Quantitation Limits

(UFP-QAPP Manual Sections 2.6.2.3)
(EPA 2106-G-05 Section 2.2.6)

Note: To-date a laboratory has not been selected. Reporting limits presented in DRAFT SAP are from previous projects.

Matrix: Soil
Analytical Method: EPA Method 8260, 8270, 6010/6020, and 7471
Concentration level (if applicable): All

Analyte	CAS No.	Project Action Levels (PALs)			Project Quantitation Limit (PQL) Goal[1] (mg/kg)	Laboratory Quantitation Limit (LQL)[2, 3] (mg/kg)	Laboratory Detection Limit (LDL)[2, 3] (mg/kg)
		EPA RSL Residential Soil THQ=1.0 (mg/kg)	EPA RSL Industrial Soil THQ=1.0 (mg/kg)	CDPHE Groundwater Protection Values (mg/kg)			
VOCs							
1,1,1,2-Tetrachloroethane	630-20-6	2	8.8	0.16	0.001	0.001	0.000264
1,1,1-Trichloroethane	71-55-6	8100	36000	62	0.001	0.001	0.000286
1,1,2,2-Tetrachloroethane	79-34-5	0.6	2.7	0.0024	0.001	0.001	0.000365
1,1,2-Trichloroethane	79-00-5	1.1	5	0.038	0.001	0.001	0.000277
1,1,2-Trichlorotrifluoroethane	76-13-1	6700	28000	1000	0.001	0.001	0.000365
1,1-Dichloroethane	75-34-3	3.6	16	1.8	0.001	0.001	0.000199
1,1-Dichloroethene	75-35-4	230	1000	12	0.001	0.001	0.000303
1,1-Dichloropropene	563-58-6	--	--	--	0.001	0.001	0.000317
1,2,3-Trichlorobenzene	87-61-6	63	930	--	0.001	0.001	0.000306
1,2,3-Trichloropropane	96-18-4	0.0051	0.11	0.00048	0.0025	0.0025	0.000741
1,2,3-Trimethylbenzene	526-73-8	340	2000	--	0.001	0.001	0.000287
1,2,4-Trichlorobenzene	120-82-1	24	110	13	0.001	0.001	0.000388
1,2,4-Trimethylbenzene	95-63-6	300	1800	--	0.001	0.001	0.000211
1,2-Dibromo-3-Chloropropane	96-12-8	0.0053	0.064	0.002	0.005	0.005	0.00105
1,2-Dibromoethane	106-93-4	0.036	0.16	0.00018	0.001	0.001	0.000343
1,2-Dichlorobenzene	95-50-1	1800	9300	57	0.001	0.001	0.000305

Analyte	CAS No.	Project Action Levels (PALs)			Project Quantitation Limit (PQL) Goal[1] (mg/kg)	Laboratory Quantitation Limit (LQL)[2, 3] (mg/kg)	Laboratory Detection Limit (LDL)[2, 3] (mg/kg)
		EPA RSL Residential Soil THQ=1.0 (mg/kg)	EPA RSL Industrial Soil THQ=1.0 (mg/kg)	CDPHE Groundwater Protection Values (mg/kg)			
1,2-Dichloroethane	107-06-2	0.46	2	0.0036	0.001	0.001	0.000265
1,2-Dichloropropane	78-87-5	2.5	11	0.0087	0.001	0.001	0.000358
1,3,5-Trimethylbenzene	108-67-8	270	1500	23	0.001	0.001	0.000266
1,3-Dichlorobenzene	541-73-1	--	--	8.5	0.001	0.001	0.000239
1,3-Dichloropropane	142-28-9	1600	23000	--	0.001	0.001	0.000207
1,4-Dichlorobenzene	106-46-7	2.6	11	7.8	0.001	0.001	0.000226
2,2-Dichloropropane	594-20-7	--	--	--	0.001	0.001	0.000279
2-Butanone (MEK)	78-93-3	27000	190000	18	0.01	0.01	0.00468
2-Chlorotoluene	95-49-8	1600	23000	--	0.001	0.001	0.000301
4-Chlorotoluene	106-43-4	1600	23000	--	0.001	0.001	0.00024
4-Methyl-2-pentanone (MIBK)	108-10-1	33000	140000	3.3	0.01	0.01	0.00188
Acetone	67-64-1	--	--	32	0.05	0.05	0.01
Acrylonitrile	107-13-1	--	--	--	0.01	0.01	0.00179
Benzene	71-43-2	1.2	5.1	0.17	0.001	0.001	0.00027
Bromobenzene	108-86-1	290	1800	3	0.001	0.001	0.000284
Bromodichloromethane	75-27-4	0.29	1.3	0.007	0.001	0.001	0.000254
Bromoform	75-25-2	19	86	0.048	0.001	0.001	0.000424
Bromomethane	74-83-9	6.8	30	0.16	0.005	0.005	0.00134
Carbon tetrachloride	56-23-5	0.65	2.9	1.704	0.001	0.001	0.000328
Chlorobenzene	108-90-7	280	1300	5.3	0.001	0.001	0.000212
Chlorodibromomethane	124-48-1	8.3	39	0.11	0.001	0.001	0.000373
Chloroethane	75-00-3	14000	57000	--	0.005	0.005	0.000946
Chloroform	67-66-3	0.32	1.4	0.085	0.005	0.005	0.000229
Chloromethane	74-87-3	110	460	--	0.0025	0.0025	0.000375

Analyte	CAS No.	Project Action Levels (PALs)			Project Quantitation Limit (PQL) Goal[1] (mg/kg)	Laboratory Quantitation Limit (LQL)[2, 3] (mg/kg)	Laboratory Detection Limit (LDL)[2, 3] (mg/kg)
		EPA RSL Residential Soil THQ=1.0 (mg/kg)	EPA RSL Industrial Soil THQ=1.0 (mg/kg)	CDPHE Groundwater Protection Values (mg/kg)			
cis-1,2-Dichloroethene	156-59-2	160	2300	0.261	0.001	0.001	0.000235
cis-1,3-Dichloropropene	10061-01-5	--	--	--	0.001	0.001	0.000262
Dibromomethane	74-95-3	24	99	--	0.001	0.001	0.000382
Dichlorodifluoromethane	75-71-8	87	370	390	0.005	0.005	0.000713
Di-isopropyl ether	108-20-3	2200	9400	--	0.001	0.001	0.000248
Ethylbenzene	100-41-4	5.8	25	100	0.001	0.001	0.000297
Hexachloro-1,3-butadiene	87-68-3	1.2	5.3	0.17	0.001	0.001	0.000342
Isopropylbenzene	98-82-8	1900	9900	700	0.001	0.001	0.000243
Methyl tert-butyl ether	1634-04-4	47	210	--	0.001	0.001	0.000212
Methylene Chloride	75-09-2	57	1000	0.06	0.005	0.005	0.001
Naphthalene	91-20-3	3.8	17	23	0.005	0.005	0.001
n-Butylbenzene	104-51-8	3900	58000	--	0.001	0.001	0.000258
n-Propylbenzene	103-65-1	3800	24000	77	0.001	0.001	0.000206
p-Isopropyltoluene	99-87-6	--	--	--	0.001	0.001	0.000204
sec-Butylbenzene	135-98-8	7800	120000	--	0.001	0.001	0.000201
Styrene	100-42-5	6000	35000	14	0.001	0.001	0.000234
tert-Butylbenzene	98-06-6	7800	120000	--	0.001	0.001	0.000206
Tetrachloroethene	127-18-4	24	100	1.9	0.001	0.001	0.000276
Toluene	108-88-3	4900	47000	50	0.005	0.005	0.000434
trans-1,2-Dichloroethene	156-60-5	1600	23000	5.4	0.001	0.001	0.000264
trans-1,3-Dichloropropene	10061-02-6	--	--	--	0.001	0.001	0.000267
Trichloroethene	79-01-6	0.94	6	0.68	0.001	0.001	0.000279
Trichlorofluoromethane	75-69-4	23000	350000	1000	0.005	0.005	0.000382
Vinyl chloride	75-01-4	0.059	1.7	0.11	0.001	0.001	0.000291

Analyte	CAS No.	Project Action Levels (PALs)			Project Quantitation Limit (PQL) Goal[1] (mg/kg)	Laboratory Quantitation Limit (LQL)[2, 3] (mg/kg)	Laboratory Detection Limit (LDL)[2, 3] (mg/kg)
		EPA RSL Residential Soil THQ=1.0 (mg/kg)	EPA RSL Industrial Soil THQ=1.0 (mg/kg)	CDPHE Groundwater Protection Values (mg/kg)			
Xylenes, Total	1330-20-7	580	2500	75	0.003	0.003	0.000698
SVOCs							
1,2,4-Trichlorobenzene	120-82-1	24	110	13	3.33	3.33	0.0876
2,4,6-Trichlorophenol	88-06-2	49	210	0.28	3.33	3.33	0.0779
2,4-Dichlorophenol	120-83-2	190	2500	0.33	3.33	3.33	0.0746
2,4-Dimethylphenol	105-67-9	1300	16000	2.7	3.33	3.33	0.471
2,4-Dinitrophenol	51-28-5	130	1600	0.4	3.33	3.33	0.98
2,4-Dinitrotoluene	121-14-2	1.7	7.4	0.0032	3.33	3.33	0.0607
2,6-Dinitrotoluene	606-20-2	0.36	1.5	0.2	3.33	3.33	0.0737
2-Chloronaphthalene	91-58-7	4800	60000	1000	0.33	0.33	0.0639
2-Chlorophenol	95-57-8	390	5800	1.2	3.33	3.33	0.0831
2-Nitrophenol	88-75-5	--	--	--	3.33	3.33	0.13
3,3-Dichlorobenzidine	91-94-1	1.2	5.1	0.041	3.33	3.33	0.794
4,6-Dinitro-2-methylphenol	534-52-1	5.1	66	--	3.33	3.33	1.24
4-Bromophenyl-phenylether	101-55-3	--	--	--	3.33	3.33	0.114
4-Chloro-3-methylphenol	59-50-7	6300	82000	--	3.33	3.33	0.0477
4-Chlorophenyl-phenylether	7005-72-3	--	--	--	3.33	3.33	0.0627
4-Nitrophenol	100-02-7	--	--	2.1	3.33	3.33	0.525
Acenaphthene	83-32-9	3600	45000	1000	0.33	0.33	0.0642
Acenaphthylene	208-96-8	--	--	--	0.33	0.33	0.0671
Anthracene	120-12-7	18000	230000	1000	0.33	0.33	0.0632
Benzidine	92-87-5	0.00053	0.01	--	3.33	3.33	0.637
Benzo(a)anthracene	56-55-3	1.1	21	1000	0.33	0.33	0.0428
Benzo(a)pyrene	50-32-8	0.11	2.1	1000	0.33	0.33	0.0548

Analyte	CAS No.	Project Action Levels (PALs)			Project Quantitation Limit (PQL) Goal[1] (mg/kg)	Laboratory Quantitation Limit (LQL)[2, 3] (mg/kg)	Laboratory Detection Limit (LDL)[2, 3] (mg/kg)
		EPA RSL Residential Soil THQ=1.0 (mg/kg)	EPA RSL Industrial Soil THQ=1.0 (mg/kg)	CDPHE Groundwater Protection Values (mg/kg)			
Benzo(b)fluoranthene	205-99-2	1.1	21	1000	0.33	0.33	0.0695
Benzo(g,h,i)perylene	191-24-2	--	--	--	0.33	0.33	0.0721
Benzo(k)fluoranthene	207-08-9	11	210	1000	0.33	0.33	0.0582
Benzylbutyl phthalate	85-68-7	290	1200	1000	3.33	3.33	0.103
Bis(2-chlorethoxy)methane	111-91-1	190	2500	--	3.33	3.33	0.077
Bis(2-chloroethyl)ether	111-44-4	0.23	1	--	3.33	3.33	0.0896
Bis(2-chloroisopropyl)ether	39638-32-9	--	--	--	3.33	3.33	0.076
Bis(2-ethylhexyl)phthalate	117-81-7	39	160	1000	3.33	3.33	0.12
Chrysene	218-01-9	110	2100	1000	0.33	0.33	0.0555
Dibenz(a,h)anthracene	53-70-3	0.11	2.1	1000	0.33	0.33	0.0821
Diethyl phthalate	84-66-2	51000	660000	140	3.33	3.33	0.0691
Dimethyl phthalate	131-11-3	--	--	--	3.33	3.33	0.054
Di-n-butyl phthalate	84-74-2	6300	82000	1000	3.33	3.33	0.109
Di-n-octyl phthalate	117-84-0	630	8200	--	3.33	3.33	0.0907
Fluoranthene	206-44-0	2400	30000	1000	0.33	0.33	0.0496
Fluorene	86-73-7	2400	30000	1000	0.33	0.33	0.0682
Hexachloro-1,3-butadiene	87-68-3	1.2	5.3	0.17	3.33	3.33	0.1
Hexachlorobenzene	118-74-1	0.21	0.96	0.009	3.33	3.33	0.0856
Hexachlorocyclopentadiene	77-47-4	1.8	7.5	1000	3.33	3.33	0.587
Hexachloroethane	67-72-1	1.8	8	0.019	3.33	3.33	0.134
Indeno(1,2,3-cd)pyrene	193-39-5	1.1	21	1000	0.33	0.33	0.0772
Isophorone	78-59-1	570	2400	1.3	3.33	3.33	0.0522
Naphthalene	91-20-3	3.8	17	23	0.33	0.33	0.0889
Nitrobenzene	98-95-3	5.1	22	0.239	3.33	3.33	0.0695

Analyte	CAS No.	Project Action Levels (PALs)			Project Quantitation Limit (PQL) Goal[1] (mg/kg)	Laboratory Quantitation Limit (LQL)[2, 3] (mg/kg)	Laboratory Detection Limit (LDL)[2, 3] (mg/kg)
		EPA RSL Residential Soil THQ=1.0 (mg/kg)	EPA RSL Industrial Soil THQ=1.0 (mg/kg)	CDPHE Groundwater Protection Values (mg/kg)			
n-Nitrosodimethylamine	62-75-9	0.002	0.034	0.000005	3.33	3.33	0.647
n-Nitrosodi-n-propylamine	621-64-7	0.078	0.33	0.00000028	3.33	3.33	0.0906
n-Nitrosodiphenylamine	86-30-6	110	470	0.67	3.33	3.33	0.0594
Pentachlorophenol	87-86-5	1	4	0.021	3.33	3.33	0.48
Phenanthrene	85-01-8	--	--	--	0.33	0.33	0.0528
Phenol	108-95-2	19000	250000	47	3.33	3.33	0.0695
Pyrene	129-00-0	1800	23000	1000	0.33	0.33	0.123
RCRA 8 Metals							
Arsenic	7440-38-2	0.68	3	--	0.5	0.5	0.0125
Barium	7440-39-3	15000	220000	--	1	1	0.16
Cadmium	7440-43-9	71	980	--	0.5	0.5	0.08
Chromium	7440-47-3	120000	1800000	--	0.5	0.5	0.27
Lead	7439-92-1	400	800	--	0.5	0.5	0.12
Mercury	7782-49-2	390	5800	--	0.5	0.5	0.19
Selenium	7440-22-4	390	5800	--	0.5	0.5	0.155
Silver	7439-97-6	11	46	--	0.02	0.02	0.0028

Notes:

-- No benchmark established

EPA - U.S. Environmental Protection Agency

EPA RSL = U.S. EPA RSLs, November 2017. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017

[1] Laboratories used will be either State certified for their specific cleanup program, or will be NELAP, NVLAP, or AIHA.

[2] Terminology is project/laboratory-specific.

Matrix: Water
Analytical Methods: EPA Method 8260, 8270, 6010/6020, and 7470
Concentration level (if applicable): All

Analyte	CAS No.	PALs		PQL Goal[1] (µg/l)	LQL[2, 3] (µg/l)	LDL[2, 3] (µg/l)
		EPA Tapwater THQ=1.0 (µg/l)	CDPHE WQCC Reg. 41 (µg/l)			
VOCs						
1,1,1,2-Tetrachloroethane	630-20-6	0.57	--	1	1	0.385
1,1,1-Trichloroethane	71-55-6	8000	14000	1	1	0.319
1,1,2,2-Tetrachloroethane	79-34-5	0.076	0.18	1	1	0.13
1,1,2-Trichloroethane	79-00-5	0.28	2.8	1	1	0.383
1,1,2-Trichlorotrifluoroethane	76-13-1	10000	--	1	1	0.303
1,1-Dichloroethane	75-34-3	2.8	--	1	1	0.259
1,1-Dichloroethene	75-35-4	280	7	1	1	0.398
1,1-Dichloropropene	563-58-6	--	--	1	1	0.352
1,2,3-Trichlorobenzene	87-61-6	7	--	1	1	0.23
1,2,3-Trichloropropane	96-18-4	0.00075	0.00037	2.5	2.5	0.807
1,2,3-Trimethylbenzene	526-73-8	55	--	1	1	0.321
1,2,4-Trichlorobenzene	120-82-1	1.2	70	1	1	0.355
1,2,4-Trimethylbenzene	95-63-6	56	--	1	1	0.373
1,2-Dibromo-3-Chloropropane	96-12-8	0.00033	0.2	5	5	1.33
1,2-Dibromoethane	106-93-4	0.0075	0.018	1	1	0.381
1,2-Dichlorobenzene	95-50-1	300	600	1	1	0.349
1,2-Dichloroethane	107-06-2	0.17	0.38	1	1	0.361
1,2-Dichloropropane	78-87-5	0.85	0.52	1	1	0.306
1,3,5-Trimethylbenzene	108-67-8	60	--	1	1	0.387
1,3-Dichlorobenzene	541-73-1	--	94	1	1	0.22
1,3-Dichloropropane	142-28-9	370	--	1	1	0.366
1,4-Dichlorobenzene	106-46-7	0.48	75	1	1	0.274

Analyte	CAS No.	PALs		PQL Goal[1] (µg/l)	LQL[2, 3] (µg/l)	LDL[2, 3] (µg/l)
		EPA Tapwater THQ=1.0 (µg/l)	CDPHE WQCC Reg. 41 (µg/l)			
2,2-Dichloropropane	594-20-7	--	--	1	1	0.321
2-Butanone (MEK)	78-93-3	5600	--	10	10	3.93
2-Chlorotoluene	95-49-8	240	--	1	1	0.375
4-Chlorotoluene	106-43-4	250	--	1	1	0.351
4-Methyl-2-pentanone (MIBK)	108-10-1	6300	--	10	10	2.14
Acetone	67-64-1	--	6300	50	50	10
Acrolein	107-02-8	--	3.5	50	50	8.87
Acrylonitrile	107-13-1	--	0.065	10	10	1.87
Benzene	71-43-2	0.46	5	1	1	0.331
Bromobenzene	108-86-1	62	56	1	1	0.352
Bromodichloromethane	75-27-4	0.13	0.56	1	1	0.38
Bromoform	75-25-2	3.3	4	1	1	0.469
Bromomethane	74-83-9	7.5	--	5	5	0.866
Carbon tetrachloride	56-23-5	0.46	0.5	1	1	0.379
Chlorobenzene	108-90-7	78	100	1	1	0.348
Chlorodibromomethane	124-48-1	0.87	14	1	1	0.327
Chloroethane	75-00-3	21000	--	5	5	0.453
Chloroform	67-66-3	0.22	3.5	5	5	0.324
Chloromethane	74-87-3	190	--	2.5	2.5	0.276
cis-1,2-Dichloroethene	156-59-2	36	14	1	1	0.26
cis-1,3-Dichloropropene	10061-01-5	--	--	1	1	0.418
Dibromomethane	74-95-3	8.3	--	1	1	0.346
Dichlorodifluoromethane	75-71-8	200	--	5	5	0.551
Di-isopropyl ether	108-20-3	1500	--	1	1	0.32
Ethylbenzene	100-41-4	1.5	700	1	1	0.384
Hexachloro-1,3-butadiene	87-68-3	0.14	0.45	1	1	0.256

Analyte	CAS No.	PALs		PQL Goal[1] (µg/l)	LQL[2, 3] (µg/l)	LDL[2, 3] (µg/l)
		EPA Tapwater THQ=1.0 (µg/l)	CDPHE WQCC Reg. 41 (µg/l)			
Isopropylbenzene	98-82-8	450	--	1	1	0.326
Methyl tert-butyl ether	1634-04-4	14	--	1	1	0.367
Methylene Chloride	75-09-2	11	5.6	5	5	1
Naphthalene	91-20-3	0.17	140	5	5	1
n-Butylbenzene	104-51-8	1000	--	1	1	0.361
n-Propylbenzene	103-65-1	660	--	1	1	0.349
p-Isopropyltoluene	99-87-6	--	--	1	1	0.35
sec-Butylbenzene	135-98-8	2000	--	1	1	0.365
Styrene	100-42-5	1200	100	1	1	0.307
tert-Butylbenzene	98-06-6	690	--	1	1	0.399
Tetrachloroethene	127-18-4	11	17	1	1	0.372
Toluene	108-88-3	1100	560	1	1	0.412
trans-1,2-Dichloroethene	156-60-5	360	140	1	1	0.396
trans-1,3-Dichloropropene	10061-02-6	--	--	1	1	0.419
Trichloroethene	79-01-6	0.49	5	1	1	0.398
Trichlorofluoromethane	75-69-4	5200	--	5	5	1.2
Vinyl chloride	75-01-4	0.019	0.023	1	1	0.259
Xylenes, Total	1330-20-7	190	1400	3	3	1.06
SVOCs						
1,2,4-Trichlorobenzene	120-82-1	1.2	70	10	10	0.355
2,4,6-Trichlorophenol	88-06-2	4.1	3.2	10	10	0.297
2,4-Dichlorophenol	120-83-2	46	21	10	10	0.284
2,4-Dimethylphenol	105-67-9	360	140	10	10	0.624
2,4-Dinitrophenol	51-28-5	39	14	10	10	3.25
2,4-Dinitrotoluene	121-14-2	0.24	0.11	10	10	1.65
2,6-Dinitrotoluene	606-20-2	0.049	--	10	10	0.279

Analyte	CAS No.	PALs		PQL Goal[1] (µg/l)	LQL[2, 3] (µg/l)	LDL[2, 3] (µg/l)
		EPA Tapwater THQ=1.0 (µg/l)	CDPHE WQCC Reg. 41 (µg/l)			
2-Chloronaphthalene	91-58-7	750	560	1	1	0.33
2-Chlorophenol	95-57-8	91	35	10	10	0.283
2-Nitrophenol	88-75-5	--	--	10	10	0.32
3,3-Dichlorobenzidine	91-94-1	0.13	0.078	10	10	2.02
4,6-Dinitro-2-methylphenol	534-52-1	1.5	0.27	10	10	2.62
4-Bromophenyl-phenylether	101-55-3	--	--	10	10	0.335
4-Chloro-3-methylphenol	59-50-7	1400	210	10	10	0.263
4-Chlorophenyl-phenylether	7005-72-3	--	--	10	10	0.303
4-Nitrophenol	100-02-7	--	56	10	10	2.01
Acenaphthene	83-32-9	530	420	1	1	0.316
Acenaphthylene	208-96-8	--	--	1	1	0.309
Anthracene	120-12-7	1800	2100	1	1	0.291
Benzidine	92-87-5	0.00011	0.00015	10	10	4.32
Benzo(a)anthracene	56-55-3	0.03	0.0048	1	1	0.0975
Benzo(a)pyrene	50-32-8	0.025	0.0048	1	1	0.34
Benzo(b)fluoranthene	205-99-2	0.25	0.0048	1	1	0.0896
Benzo(g,h,i)perylene	191-24-2	--	--	1	1	0.161
Benzo(k)fluoranthene	207-08-9	2.5	0.0048	1	1	0.355
Benzylbutyl phthalate	85-68-7	16	1400	3	3	0.275
Bis(2-chlorethoxy)methane	111-91-1	59	--	10	10	0.329
Bis(2-chloroethyl)ether	111-44-4	0.014	0.032	10	10	1.62
Bis(2-chloroisopropyl)ether	39638-32-9	--	280	10	10	0.445
Bis(2-ethylhexyl)phthalate	117-81-7	5.6	2.5	3	3	0.709
Chrysene	218-01-9	25	0.0048	1	1	0.332
Dibenz(a,h)anthracene	53-70-3	0.025	0.0048	1	1	0.279
Diethyl phthalate	84-66-2	15000	5600	3	3	0.282

Analyte	CAS No.	PALs		PQL Goal[1] (µg/l)	LQL[2, 3] (µg/l)	LDL[2, 3] (µg/l)
		EPA Tapwater THQ=1.0 (µg/l)	CDPHE WQCC Reg. 41 (µg/l)			
Dimethyl phthalate	131-11-3	--	--	3	3	0.283
Di-n-butyl phthalate	84-74-2	900	700	3	3	0.266
Di-n-octyl phthalate	117-84-0	200	--	3	3	0.278
Fluoranthene	206-44-0	800	280	1	1	0.31
Fluorene	86-73-7	290	280	1	1	0.323
Hexachloro-1,3-butadiene	87-68-3	0.14	0.45	10	10	0.329
Hexachlorobenzene	118-74-1	0.0098	0.022	1	1	0.341
Hexachlorocyclopentadiene	77-47-4	0.41	42	10	10	2.33
Hexachloroethane	67-72-1	0.33	0.88	10	10	0.365
Indeno(1,2,3-cd)pyrene	193-39-5	0.25	0.0048	1	1	0.279
Isophorone	78-59-1	78	140	10	10	0.272
Naphthalene	91-20-3	0.17	140	1	1	0.372
Nitrobenzene	98-95-3	0.14	14	10	10	0.367
n-Nitrosodimethylamine	62-75-9	0.00011	0.00069	10	10	1.26
n-Nitrosodi-n-propylamine	621-64-7	0.011	0.005	10	10	0.403
n-Nitrosodiphenylamine	86-30-6	12	7.1	10	10	0.304
Pentachlorophenol	87-86-5	0.041	0.088	10	10	0.313
Phenanthrene	85-01-8	--	--	1	1	0.366
Phenol	108-95-2	5800	2100	10	10	0.334
Pyrene	129-00-0	120	210	1	1	0.33
RCRA 8 Metals						
Arsenic	7440-38-2	0.052	--	2	2	0.25
Barium	7440-39-3	3800	--	5	5	0.36
Cadmium	7440-43-9	9.2	--	1	1	0.16
Chromium	7440-47-3	22000	--	2	2	0.54
Lead	7439-92-1	15	--	2	2	0.24

Analyte	CAS No.	PALs		PQL Goal[1] (µg/l)	LQL[2, 3] (µg/l)	LDL[2, 3] (µg/l)
		EPA Tapwater THQ=1.0 (µg/l)	CDPHE WQCC Reg. 41 (µg/l)			
Mercury	7782-49-2	100	--	0.2	0.2	0.049
Selenium	7440-22-4	94	--	2	2	0.38
Silver	7439-97-6	0.63	--	2	2	0.31

Notes:
-- No benchmark established
EPA - U.S. Environmental Protection Agency
EPA RSL = U.S. EPA RSLs, November 2017. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017
[1] Laboratories used will be either State certified for their specific cleanup program, or will be NELAP, NVLAP, or AIHA.
[2] Terminology is project/laboratory-specific.

Matrix: Building Material Debris/Soil
Analytical Method: EPA 600/R-93/116
Concentration level (if applicable): All

Analyte	Project Action Limit (PAL)	PAL Reference	Project Quantitation Limit (PQL) Goal	Laboratory Quantitation Limit	Laboratory Detection Limit
ACM	>1% Asbestos	AHERA	Trace	Trace	Trace

Notes:
AHERA – Asbestos Hazard Emergency Response Act

Matrix: Soil-Gas Vapor
Analytical Method: TO-15
Concentration level (if applicable): All

Analyte	PAL[1] (µg/m3)	PAL Reference[1]	PQL Goal (µg/m3)	LQL[2, 3] (µg/m3)	LDL[2, 3] (µg/m3)
VOCs					
ACETONE	1100000	EPA VISL	0.135	0.135	0.135
ALLYL CHLORIDE	16	EPA VISL	0.171	0.171	0.171
BENZENE	12	EPA VISL	0.147	0.147	0.147
BENZYL CHLORIDE	1.9	EPA VISL	0.311	0.311	0.311
BROMODICHLOROMETHANE	2.5	EPA VISL	0.292	0.292	0.292
BROMOFORM	85	EPA VISL	0.813	0.813	0.813

Analyte	PAL[1] (µg/m3)	PAL Reference[1]	PQL Goal (µg/m3)	LQL[2, 3] (µg/m3)	LDL[2, 3] (µg/m3)
BROMOMETHANE	170	EPA VISL	0.236	0.236	0.236
1,3-BUTADIENE	3.1	EPA VISL	0.125	0.125	0.125
CARBON DISULFIDE	24000	EPA VISL	0.169	0.169	0.169
CARBON TETRACHLORIDE	16	EPA VISL	0.368	0.368	0.368
CHLOROBENZENE	1700	EPA VISL	0.278	0.278	0.278
CHLOROETHANE	350000	EPA VISL	0.129	0.129	0.129
CHLOROFORM	4.1	EPA VISL	0.279	0.279	0.279
CHLOROMETHANE	3100	EPA VISL	0.112	0.112	0.112
2-CHLOROTOLUENE		EPA VISL	0.312	0.312	0.312
CYCLOHEXANE	210000	EPA VISL	0.184	0.184	0.184
CHLORODIBROMOMETHANE		EPA VISL	0.42	0.42	0.42
1,2-DIBROMOETHANE	0.16	EPA VISL	0.142	0.142	0.142
1,2-DICHLOROBENZENE	7000	EPA VISL	0.363	0.363	0.363
1,3-DICHLOROBENZENE		EPA VISL	0.359	0.359	0.359
1,4-DICHLOROBENZENE	8.5	EPA VISL	0.335	0.335	0.335
1,2-DICHLOROETHANE	3.6	EPA VISL	0.249	0.249	0.249
1,1-DICHLOROETHANE	58	EPA VISL	0.206	0.206	0.206
1,1-DICHLOROETHENE	7000	EPA VISL	0.194	0.194	0.194
CIS-1,2-DICHLOROETHENE		EPA VISL	0.154	0.154	0.154
TRANS-1,2-DICHLOROETHENE		EPA VISL	0.184	0.184	0.184
1,2-DICHLOROPROPANE	9.4	EPA VISL	0.277	0.277	0.277
CIS-1,3-DICHLOROPROPENE		EPA VISL	0.267	0.267	0.267
TRANS-1,3-DICHLOROPROPENE		EPA VISL	0.197	0.197	0.197
1,4-DIOXANE	19	EPA VISL	0.2	0.2	0.2
ETHANOL		EPA VISL	0.157	0.157	0.157
ETHYLBENZENE	37	EPA VISL	0.219	0.219	0.219
4-ETHYLTOLUENE		EPA VISL	0.327	0.327	0.327
TRICHLOROFLUOROMETHANE		EPA VISL	0.378	0.378	0.378
DICHLORODIFLUOROMETHANE	3500	EPA VISL	0.297	0.297	0.297
1,1,2-TRICHLOROTRIFLUOROETHANE	1000000	EPA VISL	0.527	0.527	0.527
1,2-DICHLOROTETRAFLUOROETHANE		EPA VISL	0.32	0.32	0.32
HEPTANE		EPA VISL	0.256	0.256	0.256
HEXACHLORO-1,3-BUTADIENE	4.3	EPA VISL	0.7	0.7	0.7
N-HEXANE	24000	EPA VISL	0.161	0.161	0.161
ISOPROPYLBENZENE	14000	EPA VISL	0.277	0.277	0.277
METHYLENE CHLORIDE	3400	EPA VISL	0.161	0.161	0.161

Analyte	PAL[1] (µg/m3)	PAL Reference[1]	PQL Goal (µg/m3)	LQL[2, 3] (µg/m3)	LDL[2, 3] (µg/m3)
METHYL BUTYL KETONE	1000	EPA VISL	0.279	0.279	0.279
2-BUTANONE (MEK)	170000	EPA VISL	0.145	0.145	0.145
4-METHYL-2-PENTANONE (MIBK)	100000	EPA VISL	0.266	0.266	0.266
METHYL METHACRYLATE	24000	EPA VISL	0.317	0.317	0.317
METHYL TERT-BUTYL ETHER	360	EPA VISL	0.182	0.182	0.182
NAPHTHALENE	2.8	EPA VISL	0.806	0.806	0.806
2-PROPANOL	7000	EPA VISL	0.217	0.217	0.217
PROPENE	100000	EPA VISL	0.16	0.16	0.16
STYRENE	35000	EPA VISL	0.198	0.198	0.198
1,1,2,2-TETRACHLOROETHANE	1.6	EPA VISL	0.396	0.396	0.396
TETRACHLOROETHENE	360	EPA VISL	0.337	0.337	0.337
TETRAHYDROFURAN	70000	EPA VISL	0.15	0.15	0.15
TOLUENE	170000	EPA VISL	0.188	0.188	0.188
1,2,4-TRICHLOROBENZENE	70	EPA VISL	1.1	1.1	1.1
1,1,1-TRICHLOROETHANE	170000	EPA VISL	0.362	0.362	0.362
1,1,2-TRICHLOROETHANE	5.8	EPA VISL	0.156	0.156	0.156
TRICHLOROETHENE	16	EPA VISL	0.292	0.292	0.292
1,2,4-TRIMETHYLBENZENE	240	EPA VISL	0.237	0.237	0.237
1,3,5-TRIMETHYLBENZENE		EPA VISL	0.31	0.31	0.31
2,2,4-TRIMETHYLPENTANE		EPA VISL	0.213	0.213	0.213
VINYL CHLORIDE	5.6	EPA VISL	0.117	0.117	0.117
VINYL BROMIDE	2.9	EPA VISL	0.318	0.318	0.318
VINYL ACETATE	7000	EPA VISL	0.225	0.225	0.225
M&P-XYLENE	3500	EPA VISL	0.41	0.41	0.41
O-XYLENE	3500	EPA VISL	0.274	0.274	0.274

Notes:
-- No benchmark established
EPA - U.S. Environmental Protection Agency
VISL = Vapor Intrusion Screening Level Sub Slab, June 2016.

Worksheet 22 — Field Equipment Calibration, Maintenance, Testing, and Inspection

(UFP-QAPP Manual Section 3.1.2.4)
(EPA 2106-G-05 Section 2.3.6)

WESTON field personnel are responsible for the calibration of WESTON field equipment and field equipment provided by subcontractors. Documented and approved procedures will be used for calibrating measuring and testing equipment. Widely accepted procedures, such as those published by U.S. EPA and ASTM, or procedures provided by manufacturers in equipment manuals will be adopted. Items may include, but are not limited to those identified in the table below.

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Title or Position of Responsible Person	Verification	SOP Reference[1]
Horiba U-50/YSI® 600XLM Water Quality Meters	Calibrate probes with standards per instrument instruction manual	Check batteries, clean probes, store in manufacturer recommended solution	Calibration check	Visually inspect for external damage to probe(s)	Refer to instrument SOP	Refer to instrument SOP	Refer to instrument SOP	Field personnel	WAM/COR	G-13/G-14
Geoprobe®	N/A	Change oil/other fluids and lubricate as needed	Operational equipment checks	Visually inspect equipment	Prior to sampling	Hydraulics are operational	Repair as needed	Field personnel	WAM/COR	2050
X-MET™ 880 X-Ray Florescence (XRF)	Check factory calibration with known standards	Check battery	Calibration check	Visually inspect for external damage (e.g., perforated lens, etc.)	Refer to instrument SOP	Refer to instrument SOP	Refer to instrument SOP	Field personnel	WAM/COR	1707
Photoionization Detector (PID) and/or Flame Ionization Detector (FID)	Calibrate with span gas, as recommended by manufacturer	Check battery	Calibration check	Visually inspect equipment	Refer to instrument SOP	Refer to instrument SOP	Refer to instrument SOP	Field personnel	WAM/COR	G-15/ MultiRae/ Toxic Vapor Analyzer (TVA) - 1000
Draeger Tubes®/Colorimetric Tubes	Not applicable (NA)	Store tubes out of direct sunlight and at a temperature of less than 25°C (77°F)	Operational equipment checks	Visually inspect for obvious defects/breaks	Pre-calibrated for two years	+/- 10% standard deviation on the results	Replace	Field personnel	WAM/COR	NA
Water Level Indicators	Calibrate tape against calibrated steel measuring tape	Clean prior and after each use, check battery	Calibration and operational equipment check	Visually inspect for obvious defects, broken parts, or cleanliness	Prior to use	Equipment operational	Repair/ replace as needed	Field personnel	WAM/COR	Instrument-Specific

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Title or Position of Responsible Person	Verification	SOP Reference[1]
Sampling Tools (Disposable Scoops)	NA	NA	NA	Visually inspect for obvious defects or broken parts	Prior to use	NA	Replace	Field personnel	WAM/COR	NA
Disposable, inert sample mixing containers	NA	NA	NA	Visually inspect for cleanliness	Prior to use	NA	Replace	Field personnel	WAM/COR	NA
Metal sampling equipment as necessary (trowels)	NA	Clean prior and after each use	NA	Visually inspect for cleanliness	Prior to use	Should be covered from previous decontaminati on procedure	Perform decontaminat ion procedure again as needed	Field personnel	NA	Metal sampling equipment as necessary (trowels)

[1] Refer to Field SOPs (Worksheet 21) and Analytical SOPs (Worksheet 23).

Worksheet 24 — Analytical Instrument Calibration

(UFP-QAPP Manual Section 3.2.2)
(EPA 2106-G-05 Section 2.3.6)

As stated in Worksheet 22, WESTON field personnel are responsible for the calibration of WESTON and sub-contractor provided analytical field equipment. Documented and approved procedures will be used for calibrating measuring and testing equipment. Widely accepted procedures, such as those published by U.S. EPA and ASTM, or procedures provided by manufacturers in equipment manuals will be adopted.

The responsibility for the calibration of laboratory equipment rests with the selected laboratories. Each type of instrumentation and each U.S. EPA-approved method have specific requirements for the calibration procedures, depending on the analytes of interest and the sample medium. The calibration procedures and frequencies of the equipment used to perform the analyses will be in accordance with requirements established by the U.S. EPA. The laboratory QA manager will be responsible for ensuring that the laboratory instrumentation is maintained in accordance with specifications. Individual laboratory SOPs will be followed for corrective actions and preventative maintenance frequencies. Laboratory quality control, calibration procedures, corrective action procedures, and instrument preventative maintenance will be included in an addendum to this QAPP once the laboratories have been selected for each of the TBA sites. The following information is project-specific and will be identified in the site-specific FSP, SAP, and/or QAPP. Items may include, but are not limited to those identified in the table below.

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Title/Position Responsible for CA	SOP Reference[1]
X-MET™ 880 Portable XRF Analyzer	Refer to Worksheet 22	Refer to Worksheet 22	Refer to Worksheet 22	Refer to Worksheet 22	Refer to Worksheet 22	1707
Colorimetric	See 7196A	Once per sample matrix analyzed	Spiked aliquots recovery within ± 15% of true value	If analysis solution over concentrated, dilute solution and re-calculate results. If under concentrated, dilute sample and reanalyze.	Lab Manager/ Analyst	7196A
CVAA	See 7470A, 7471B, ISM01.3	Daily initial calibration prior to sample analysis. Perform instrument re-calibration once per year minimum.	R^2 ≥0.995 for linear regression	Correct problem then repeat initial calibration. If calibration fails again, re-digest the entire digestion batch.	Lab Manager/ Analyst	7470A, 7471B, ISM01.3
GC/ GC/MD	See 8081B, 8082A, 8151A, TO-4A, TO-18	Initial calibration after instrument set up, then when daily 12-hour calibration verification criteria are not met	For all target compounds, initial r^2 >0.995; and calibration verification % difference <15%	Inspect system; correct problem; re-run calibration and affected samples	Lab Manager/ Analyst	8081B, 8082A, 8151A, TO-4A, TO-18

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Title/Position Responsible for CA	SOP Reference[1]
GC/MS	See 8260C, 8270D, 613, TO-13A, TO-15, SOM01.2	Initial calibration after instrument set up, then when daily 12-hour calibration verification criteria are not met	For all target compounds, initial r^2 >0.995; and calibration verification % difference <15%	Inspect system; correct problem; re-run calibration and affected samples	Lab Manager/ Analyst	8260C, 8270D, 613, TO-13A, TO-15, SOM01.2
HRGC/ HRMS	See 1613B, 1668C	Calibration and initial calibration verification after instrument set up, then daily; repeat every 6 months (or whenever new calibration standard solutions are prepared)	Initial and continuing calibration verification within ± 20% of true values	Inspect system; correct problem; re-run calibration and affected samples	Lab Manager/ Analyst	1613B, 1668C
HPLC	See 8330A, 8330B	Calibration and initial calibration verification after instrument set up, then daily; continuing calibration verification 10% or every 2 hours, whichever is more frequent	Calibration – $r^2 \geq 0.99$, $r \geq 0.995$; initial and continuing calibration verification within ± 20% of true values	Inspect system; correct problem; re-run calibration and affected samples	Lab Manager/ Analyst	8330A, 8330B
ICP-AES	See 6010C	Calibration and initial calibration verification after instrument set up, then daily; continuing calibration verifications. Upper range within 10%. New upper range limits should be determined whenever a significant change in instrument response or every six months. Low-level continuing calibration verification (LLCCV) standard with 30%.	Initial and continuing calibration verification within ± 10% of upper range true values and ± 30% LLCCV true values.	Inspect system; correct problem; re-run calibration and affected samples	Lab Manager/ Analyst	6010C
ICP/ ICP-MS	See 6010C, 6020A, ISM01.3	Calibration and initial calibration verification after instrument set up, then daily; continuing calibration verification 10% or every 2 hours, whichever is more frequent	Calibration r^2 >0.995; initial and continuing calibration verification within ± 20% of true values	Inspect system; correct problem; re-run calibration and affected samples	Lab Manager/ Analyst	6010C, 6020A, ISM01.3

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Title/Position Responsible for CA	SOP Reference[1]
TEM	See 540/R-97/028, 100.1, 100.2, NIOSH Method 7402	Calibration and initial calibration verification after instrument set up, then as needed (at least once daily use)	Qualitative electron diffraction; calibration of TEM magnification and EDX system within typical range profiles	Re-calibrate qualitative electron diffraction; calibration of TEM magnification and EDX system; re-run calibration and affected samples	Lab Manager/ Analyst	540/R-97/028, 100.1, 100.2, NIOSH Method 7402
PCM	NIOSH Method 7400	At least once daily use	For asbestos counting using test slide, the microscope optics must completely resolve grooved lines in block 3 (May appear faint) and the grooved lines in blocks 6 and 7 must be invisible when centered in the graticule area. Blocks 4 and 5 must be at least partially visible but may vary slightly in visibility between microscopes.	Re-perform test slide; re-run calibration and affected samples	Lab Manager/ Analyst	NIOSH Method 7400
PLM	600/R-93/116	Sufficient to ensure proper operation, but once per year by microscope service professional	Alignment of polarizer at 90° to analyzer, and coincident with cross-lines, proper orientation of Red I compensator plate, field diaphragm in the plane of the specimen, centering of central dispersion staining stop, etc.	Re-perform microscope alignment checks; service by professional (if needed)	Lab Manager/ Analyst	600/R-93/116

[1] Refer to the Analytical SOPs table (Worksheet 23). A laboratory-specific QA Manual may be referenced on a project-specific basis and will be identified in the site specific FSP, SAP, and/or QAPP.

Worksheet 25 — Analytical Instrument and Equipment Maintenance, Testing, and Inspection

(UFP-QAPP Manual Section 3.2.3)
(EPA 2106-G-05 Section 2.3.6)

The following information is project-specific and will be identified in the site-specific FSP, SAP, and/or QAPP. All laboratories conducting analyses of samples collected under the contract are required to have a preventative maintenance program covering testing, inspection, and maintenance procedures and schedule for each measurement system and required support activity. The basic requirements and components of such a program include the following:

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/ Position Responsible for CA	SOP Reference[1]
Colorimetric	Replace disposable, flush lines, clean autosampler and pump rollers	Analytical standards	Instrument performance and sensitivity	Daily or as needed	CCV pass criteria	Recalibrate	Analyst	7196A
CVAA	Replace disposables, flush lines, check lamp current and gas flow	Sensitivity check	Instrument performance and sensitivity	Daily or as needed	CCV pass criteria	Recalibrate	Analyst	7470A, 7471B
GC/ GC/MD	Replace disposables, bake out instrument, condition column	See the analytical method and instrument manufacture's recommendations	Check connections, perform leak tests	Daily or as needed	CCV pass criteria	Inspect system; correct problem; re-run calibration and affected samples	Analyst	8081B, 8082A, 8151A, TO-4A, TO-18
GC/MS	Replace disposables, bake out instrument, condition column	See the analytical method and instrument manufacture's recommendations	Check connections, perform leak tests	Daily or as needed	CCV pass criteria	Inspect system; correct problem; re-run calibration and affected samples	Analyst	8260C, 8270D, 613, TO-13A, TO-15, SOM01.2
HRGC/HRMS	Source cleaning, changing pump oil, etc.	HRMS system tuned to minimum static resolving power; resolution of the HRGC system verified by analyses of descriptor switching times using WDM and resolution verified by Isomer Specificity Check.	Check connections, perform leak tests, etc.	Prior to each 12-hour shift	Technical acceptance criteria must be met before any standards, samples, QC samples, and required blanks are analyzed.	If the technical acceptance criteria are not met, the instrument must be adjusted until the technical acceptance criteria are met, HRGC column replaced,	Analyst	1613B, 1668C, 8290A

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/ Position Responsible for CA	SOP Reference[1]
HPLC	Replace columns, Diode Array Detector flow cell windows and ball-valve cartridges as needed, clean/change filters, check eluent reservoirs	Sensitivity check	Instrument performance and sensitivity	Daily or as needed	CCV pass criteria	Recalibrate	Analyst	8330A, 8330B
ICP-AES	Replace disposable, flush lines, and clean autosampler	Analytical standards	Instrument performance and sensitivity	Daily or as needed	CCV pass criteria	Recalibrate	Analyst	6010C
ICP/ICP-MS	Replace pump windings and gas tanks, check standard and sample flow	Monitor instrument standard (ISTD) counts for variation	Instrument performance and sensitivity	As needed	Monitor ISTD counts for variation	Replace windings, recalibrate and reanalyze	Analyst	6010C, 6020A
TEM	Qualitative electron diffraction; calibration of TEM magnification and EDX system.	Sensitivity check	Instrument performance and sensitivity	Daily or as needed	Within typical range profiles	Recalibrate	Analyst	540/R-97/028, 100.1, 100.2, NIOSH Method 7402
PCM	Perform test of microscope optics with HSE/NPL test slide	Sensitivity check	Instrument performance and sensitivity	Daily or as needed	Microscope optics meet HSE/NPL test slide criteria	Recalibrate	Analyst	NIOSH Method 7400
PLM	Alignment of polarizer orientation of Red I compensator plate, field diaphragm check, centering of central dispersion staining stop, etc.	Alignment checks	Instrument performance and sensitivity	Daily or as needed	Microscope alignment checks acceptable	Recalibrate	Analyst	600/R-93/116

[1] Refer to the Analytical SOPs table (Worksheet 23). A laboratory-specific QA Manual may be referenced on a project-specific basis and will be identified in the site specific FSP, SAP, and/or QAPP.

Worksheet 26 & 27 — Sample Handling, Custody, and Disposal

(UFP-QAPP Manual Section 3.3)
(EPA 2106-G-05 Manual Section 2.3.3)

Examples of field documentation are presented in the QAPP such as the field form (QAPP Appendix L), chain-of-custody (QAPP Appendix M), and sample label and custody seal (QAPP Appendix N). SOPs for sample handling (identified in the table below) are located in QAPP Appendix H.

Sampling Organization: START
Laboratory: TDB
Method of sample delivery (shipper/carrier): Drop-off/FedEx
Number of days from reporting until sample disposal: TBD

Activity	Organization and Title or Position of Person Responsible for the Activity	SOP Reference
Sample Labeling	START Field Personnel	QAPP Appendix H; SOP G-1 & G-3
Chain-of-Custody Form Completion	START Field Personnel	QAPP Appendix H; SOP G-8
Sample Packaging	START Field Personnel	QAPP Appendix H; SOP G-9
Shipping Coordination	START Field Personnel	QAPP Appendix H; SOP G-9
Sample Receipt, Inspection, & Log-in	Laboratory Sample Custodian	Laboratory SOP
Sample Custody and Storage	Laboratory Sample Custodian /Laboratory Analytical Personnel	Laboratory SOP
Sample Disposal	START Field Personnel/Laboratory Sample Custodian /Laboratory Analytical Personnel	QAPP Appendix H; SOP G-1 & G-3 Laboratory SOP

Supplies and consumables can be received at a WESTON office, U.S. EPA Warehouse, or other designated locations (e.g., hotel). When supplies are received at a WESTON office or U.S. EPA Warehouse, the PM or PTL will sort the supplies according to vendor, check packing slips against purchase orders, and inspect the condition of all supplies before the supplies are accepted for use on a project. If the supplies do not meet the acceptance criteria, deficiencies will be noted on the packing slip and purchase order. The item will then be returned to the vendor for replacement or repair. Procedures for receiving supplies and consumables in the field are similar to those described above. Upon receipt, items will be inspected by the START PM or PTL against the acceptance criteria. Any deficiencies or problems will be noted in the field logbook, and deficient items will be returned for immediate replacement.

Data collection activities, including sample collection and data generation, will be verified in accordance with the START IV Program QAPP, Worksheet 35.

Data will be validated by START. Data will be reviewed for usability in accordance with the START IV Program QAPP, Worksheet 37.

Worksheet 29 — Project Documents and Records

(UFP-QAPP Manual Section 3.5.1)
(EPA 2106-G-05 Section 2.2.8)

Information in this worksheet is project-specific and will be identified in the site-specific FSP, SAP, and/or QAPP. All records will be generated and verified by WESTON personnel only, stored electronically on the WESTON server and backed up daily. All hard and electronic copies of finalized documents and technical project documents (including but not limited to the QAPP, HASP, etc.) will be retained by WESTON in accordance with Section H.20 of Contract No.: EP-S8-13-01. Other project-related files, such as contract documents, employee benefits, and other information will be retained in accordance with WESTON Policies and Procedures.

Sample Collection and Field Records			
Record	**Generation**	**Verification**	**Storage Location/Archival**
Field Logbook or Data Collection Sheets	PTL/Field Scientist	Delegated QA Manager	Project File
Chain-of-Custody (COC) Forms	PTL/Field Scientist	Delegated QA Manager	Project File
Custody Seals	PTL/Field Scientist	Delegated QA Manager	Project File
Air Bills	PTL/Field Scientist	Delegated QA Manager	Project File
Daily QC Reports	PTL	Delegated QA Manager	Project File
Deviations	PTL/Field Scientist	Delegated QA Manager	Project File
Corrective Action Reports	Delegated QA Manager	PM	Project File
Correspondence	PTL	Delegated QA Manager	Project File
Field Sample Results/Measurements	PTL/Field Scientist	Delegated QA Manager	Project File
Tailgate Safety Meeting Items	PTL/Field Safety Officer	Delegated QA Manager	Project File

Project Assessments			
Record	**Generation**	**Verification**	**Storage Location/Archival**
Field Analysis Audit Checklist	Delegated QA Manager	PM	Project File
Fixed Laboratory Audit Checklist	Delegated QA Manager	PM	Project File
Data Verification Checklists	Delegated QA Manager	PM	Project File
Data Validation Report	Delegated QA Manager	PM	Project File
Data Usability Assessment Report	Delegated QA Manager	PM	Project File
Corrective Action Reports	Delegated QA Manager	PM	Project File
Correspondence	Delegated QA Manager	PM	Project File

Project Assessments			
Laboratory Records			
Record	**Generation**	**Verification**	**Storage Location/Archival**
Sample Receipt, Custody, and Checklist	Laboratory Sample Receiving	Laboratory PM/Delegated QA Manager	Laboratory and Project File
Equipment Calibration Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory and Project File
Standard Traceability Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory and Project File
Sample Prep Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory and Project File
Run Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory and Project File
Equipment Maintenance, Testing, and Inspection Logs	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory and Project File
Corrective Action Reports	Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory and Project File
Laboratory Analytical Results	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory and Project File
Laboratory QC Samples, Standards, and Checks	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory and Project File
Instrument Results (raw data) for Primary Samples, Standards, QC Checks, and QC Samples	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory and Project File
Sample Disposal Records	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory and Project File

Laboratory Data Deliverables[1]						
Record	**VOCs**	**SVOCs**	**PCBs**	**Pesticides**	**Metals**	**Other**
Narrative						
COC						
Summary Results						
QC Results						
Chromatograms						
Tentatively Identified Compounds						

[1] The Laboratory Data Deliverables table is designed to be a checklist for use in supporting data completeness. The records and analytical groups in this table are not all inclusive of those that may be used on a specific project and should be modified and utilized by the Delegated QA Manager as applicable.

Worksheet 31, 32 & 33 — Assessments and Corrective Action

(UFP-QAPP Manual Sections 4.1.1 and 4.1.2)
(EPA 2106-G-05 Section 2.4 and 2.5.5)

Information in this worksheet is project-specific and will be identified in the site-specific FSP, SAP, and/or QAPP. All reports will be prepared by WESTON and distributed to the following to include but not be limited to the WESTON PM, Program Manager and Delegated QA Manager, and the U.S. EPA COR, WAM, and DAO as applicable.

Assessment Type	Responsible Party & Organization	Number/ Frequency	Estimated Dates	Assessment Deliverable	Deliverable Due Date
Field Sampling Technical Systems Audit (TSA)[1]	Tana Jones, PMP Delegated QA Manager WESTON Roy Weindorf, P.G. PM WESTON Tim Rehder, WAM, COR EPA	Minimum one audit per sample collection activity per assessment. Second audit if a second phase starts more than 6 months after the initial phase / Once, then as needed	TBD	TSA Memorandum and Checklist	TBD
Laboratory TSA[2]	Laboratory QA Manager TBD Tana Jones, PMP Delegated QA Manager WESTON Tim Rehder, WAM, COR EPA	CLP, CRL, and certified sub-contract laboratories are routinely audited by accrediting authorities. The laboratory QA manager and/or WESTON Delegated QA Manager will perform audits on a project-specific basis as needed	TBD	Analytical TSA Memorandum and Checklist	TBD
Project-Specific PT Samples	Tana Jones, PMP Delegated QA Manager WESTON Chemist WESTON/START Tim Rehder, WAM, COR EPA	TBD	TBD	PT Deficiency Report	TBD

Assessment Type	Responsible Party & Organization	Number/ Frequency	Estimated Dates	Assessment Deliverable	Deliverable Due Date
Management Review	Tana Jones, PMP Delegated QA Manager WESTON Roy Weindorf, P.G. PM WESTON Tim Rehder, WAM, COR EPA	TBD	TBD	QA Management Report	TBD
Corrective Action	Tana Jones, PMP Delegated QA Manager WESTON Roy Weindorf, P.G. PM WESTON Tim Rehder, WAM, COR EPA	TBD	TBD	Corrective Action Reports	TBD
Data Validation	Chemist WESTON/START	TBD	TBD	Data Validation Report	TBD
Contract Closeout	Mark Blanchard, P.G., LEED® AP Program Manager WESTON	TBD	TBD	Contract Closeout Report	TBD

[1] Field sampling TSAs may include, but are not limited to the following: sample collection records; sample handling, preservation, packaging, shipping, and custody records; equipment operation, maintenance, and calibration records.

[2] Laboratory TSAs may include, but are not limited to the following: sample log-in, identification, storage, tracking, and custody procedures; sample and standards preparation procedures; availability of analytical instruments; analytical instrument operation, maintenance, and calibration records; laboratory security procedures; qualifications of analysts; case file organization and data handling procedures.

Worksheet 35 — Data Verification Procedures

(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

The following information is project-specific and will be identified in the site-specific FSP, SAP, and/or QAPP. Inputs may include, but are not limited to those identified in the table below. Record retention is addressed in Worksheet 29.

Records Reviewed	Required Documents	Process Description	Responsible Person, Organization
Approved QAPP	Programmatic and site-specific FSP, SAP, and/or QAPP, Contract	Verify completeness, correctness, and contractual compliance of all project QA/QC and data set against the methods, SOPs, and contract requirements conforms.	Tana Jones, PMP, WESTON Cecilia H. Shappee, P.E., WESTON Mark Blanchard, P.G. LEED® AP Laboratory PM, TBD
Field SOPs	Programmatic and site-specific FSP, SAP, and/or QAPP, SOPs	Ensure that all field sampling SOPs were followed.	Tana Jones, PMP, WESTON
Analytical SOPs	Programmatic and site-specific FSP, SAP, and/or QAPP, SOPs	Ensure that all laboratory analytical SOPs were followed.	Laboratory PM, TBD
Laboratory QA Manual	Programmatic and site-specific FSP, SAP, and/or QAPP	Verify that applicable laboratory SOPs included in the laboratory QA manual were followed.	Tana Jones, PMP, WESTON Laboratory PM, TBD
Laboratory Certifications	Programmatic and site-specific FSP, SAP, and/or QAPP	Ensure that laboratory performing analytical sample analyses has current State, National Environmental Laboratory Accreditation Program, National Voluntary Laboratory Accreditation Program, or American Industrial Hygiene Association certifications as required by the project.	Tana Jones, PMP, WESTON Laboratory PM, TBD
Field Logbook, Field Sheets, Sample Diagrams/ Surveys	Programmatic and site-specific FSP, SAP, and/or QAPP	Verify that records are present and complete for each day of field activities. Verify that all planned samples including field QC samples were collected and that sample collection locations are documented. Verify that meteorological data were provided for each day of field activities. Verify that changes/exceptions are documented and were reported in accordance with requirements. Verify that any required field monitoring was performed and results are documented.	Tana Jones, PMP, WESTON
Equipment Calibration Records	Programmatic and site-specific FSP, SAP, and/or QAPP, SOPs, field logbook	Ensure that all field analytical instrumentation SOPs and laboratory analytical SOPs for equipment calibration were followed.	Tana Jones, PMP, WESTON Laboratory PM, TBD
COC Forms	Programmatic and site-specific FSP, SAP, and/or QAPP	Verify the completeness of COC records. Examine entries for consistency with the field logbook. Check that appropriate methods and sample preservation have been recorded. Verify that the required	Tana Jones, PMP, WESTON Laboratory PM, TBD

Records Reviewed	Required Documents	Process Description	Responsible Person, Organization
		volume of sample has been collected and that sufficient sample volume is available for QC samples (e.g., MS/MSD). Verify that all required signatures and dates are present. Check for transcription errors.	
Relevant reports, and correspondence	Programmatic and site-specific FSP, SAP, and/or QAPP	Verify that reports are present and complete for each day of field activities. Verify that correspondence are documented and were reported in accordance with requirements.	Tana Jones, PMP, WESTON
Laboratory Deliverable	Programmatic and site-specific FSP, SAP, and/or QAPP	Verify that the laboratory deliverable contains all records specified in the QAPP. Check sample receipt records to ensure sample condition upon receipt was noted, and any missing/broken sample containers were noted and reported according to plan. Compare the data package with COCs to verify that results were provided for all collected samples. Review the narrative to ensure all QC exceptions are described. Check for evidence that any required notifications were provided to project personnel as specified in the QAPP. Verify that necessary signatures and dates are present.	Tana Jones, PMP, WESTON Chemist, WESTON
Audit Reports, Corrective Action Reports	Programmatic and site-specific FSP, SAP, and/or QAPP	Verify that all planned audits were conducted. Examine audit reports. For any deficiencies noted, verify that corrective action was implemented according to plan.	Tana Jones, PMP, WESTON Chemist, WESTON Laboratory PM, TBD

This worksheet describes the issue resolution process and the individual responsible for conveying results to data users. For issues internal to the laboratory, the laboratory PM will be the responsible party for data resolution issues and will be responsible for conveying this information to the Delegate QA Manager or delegated authority. For external laboratory data and quality issues, the Delegated QA Manager or delegated authority will provide issue resolution information and will be the responsible party for conveying this information to data users. For quality documents, reports, and field information, the Delegated QA Manager, delegated authority, or other persons identified in the table above will be responsible for issue resolutions of such items and will be the responsible party for conveying that information to data users.

Worksheet 36 — Data Validation Procedures

(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Data Validator: START

Analytical Group/ Method	Data Deliverable Requirements	Analytical Specifications	Measurement Performance Criteria (MPC)	Percent of Data Packages to be Validated	Percent of Raw Data Reviewed	Percent of Results to be Recalculated	Validation Procedure	Validation Code[1]	Electronic Validation Program/ Version
EPA Methods 600/R-93/116, 6010/6020, 7470/7471, 8260, 8270	Staged Electronic Data Deliverable (SEDD) Stage 1	QAPP Worksheet 28	QAPP Worksheets 11, 12, 19 & 30	100	0	0	U.S. EPA – Stage 1	SV2aM (manual)	N/A

[1] Validation Codes are provided in QAPP Appendix R.

Validation will be performed on all laboratory analytical data unless a defined quantity or percentage of samples is identified by the U.S. EPA in the Technical Direction Document or during the project-scoping meeting on a project-specific basis. Project validation criteria as per QAPP Worksheets 12, 15, 19 & 30, 28, and 36, and cited U.S. EPA SW-846 methodology will be used. WESTON-contracted laboratory data packages will be verified and validated using a Stage 1 validation, as described in the U.S. EPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use (January 2009) (QAPP Appendix O) unless otherwise specified by the U.S. EPA WAM/COR during the development of the DQOs. Validation Qualifiers will be applied using the following hierarchy: Region 8 UFP-QAPP for Removal Actions and Emergency Responses; the site-specific SAP, and/or QAPP; EPA National Functional Guidelines for Organic Data Review (QAPP Appendix P); EPA National Functional Guidelines for Inorganic Data Review (QAPP Appendix Q); U.S. EPA Publication SW-846; and the laboratory-specific SOP. Methods for which no data validation guidelines exist will be validated following the guidance deemed most appropriate by the data validator. State specific data validation requirements will also be met, when applicable.

The data validator will receive all laboratory packages and analytical results electronically. Additionally, the validator will be required to submit final validation reports via Portable Document Format (PDF) format and must provide an annotated laboratory analytical result electronic data deliverable (EDD) with applicable data validation qualifiers (QAPP Appendix R) identified in the site-specific SAP, and/or QAPP, and/or result value modifications. The Delegated QA Manager will use U.S. EPA document Using Qualified Data to Document an Observed Release and Observed Contamination (July 1996) to aid in determining the use of qualified data to document all observed release and observed contamination by chemical analysis under U.S. EPA's Hazard Ranking System (HRS). Approved data will be released by the Delegated QA Manager for reporting.

QAPP Worksheet 35 describes the issue resolution process and the individual responsible for conveying results to data users. For issues internal to the laboratory, the laboratory PM will be the responsible party for data resolution issues and will be responsible for conveying this information to the Delegate QA Manager or delegated authority. For external laboratory data and quality issues, the Delegated QA Manager or delegated authority will provide issue resolution information and will be the responsible party for conveying this information to data users. For quality documents, reports, and field information, the Delegated QA Manager, delegated authority, or other persons identified in the table in QAPP Worksheet 35 will be responsible for issue resolutions of such items and will be the responsible party for conveying that information to data users.

Worksheet 37 — Data Usability Assessment

(UFP-QAPP Manual Section 5.2.3 and Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

Personnel (organization and position/title) responsible for participating in the data usability assessment may include, but not be limited to:

WESTON PM
WESTON Delegated QA Manager
WESTON Risk Assessor
WESTON Chemist
WESTON PTL
WESTON Statistician

Based on project-specific oversight responsibilities and analytical scopes, this data usability assessment worksheet outlines the approach that will be taken as the analytical scope expands on a project-specific basis. The following general steps will be followed to assure that the data usability assessment evaluates whether underlying assumptions used during systematic planning are supported, sources of uncertainty have been accounted for and are acceptable, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence:

- Step 1 – Review the project's objectives and sampling design.
- Step 2 – Review the data verification and data validation outputs.
- Step 3 – Verify the assumptions of the selected statistical method
- Step 4 – Implement the statistical method.
- Step 5 – Document data usability and draw conclusions.

The data usability assessment is considered the final step in the data evaluation process. All data will be assessed for usability, regardless of the data evaluation/validation process implementation. Data usability goes beyond validation in that it evaluates the achievement of the DQOs based on the comparison of the project DQIs and individual study-specific work plans, with the obtained results. The results of the data usability assessment, and particularly any changes to the DQOs necessitated by the data not meeting usability criteria, will be reported in accordance with Worksheet 6.

Primarily, the assessment of the usability will follow procedures described in appropriate EPA guidance documents, particularly *Guidance for Data Usability in Risk Assessment* (Publication No. 9285.7-05FS, September 1992) (Appendix S), and will be conducted according to the process outlined below.

1. **Sampling and Analysis Activities Evaluation**: The first part of the data usability evaluation will include a review of the sampling and analysis activities in comparison to project-specific DQIs and study-specific work plans. Specific limitations to the data (i.e., results that are qualified as estimated [J/UJ], or rejected [R], will be determined and documented in the database).

2. **Achievement of DQIs**: The second part of data usability pertains to the achievement of the program-specific DQIs. Each investigator will compare the performance achieved for each data quality criterion against the expected and planned performance. In general, this comparison will follow from the DQIs used to define each DQO. This comparison is the most critical component of the assessment process. Any deviation from planned performance will be documented and evaluated to determine whether

corrective action is advisable. Potential corrective actions will range from re-sampling and/or reanalysis of data, to qualification or exclusion of the data for use in the data interpretation. In the event that corrective action is not possible, the limitations, if any, of the data with regard to achieving the DQOs will be noted.

In conjunction with the DQI achievement review, the investigators will need to make decisions for the use of qualified values, which are a consequence of the formalized evaluation/validation process. Data qualifiers will be applied to individual data results. Data usability decisions will be made based on the assessment of the usability of each of these results for the intended purpose. Evaluation will describe the uncertainty (bias, imprecision, etc.) of the qualified results. Cumulative QC exceedances from the DQIs may require technical judgment to determine the overall effect on the usability of the data. Decisions about usability of qualified data for use in risk assessment will be based on the EPA document mentioned, which allows for the use of estimated values. Finally, data users may choose to determine final data usability qualifiers as a result of this overall examination and decision process.

3. **Achievement of DQOs**: The final part in the data usability process concerns achievement of the DQOs. Once the data set has been assessed to be of known quality, data limitations have been documented, and overall result applicability/usability for its intended purpose has been determined, the final data assessment can be initiated by considering the answers to the following questions:

    - Are the data adequate to determine the extent to which hazardous substances have migrated or to what extent they were expected to migrate from potential hazardous substance source areas?
    - Do the data collected adequately characterize the nature and extent of potential hazardous substance source areas at the site?
    - Are the data statistically adequate to evaluate on a per chemical and per media basis?
    - Do the data collected allow assessment of hydrogeological factors, which may influence contaminant migration/distribution?
    - Do laboratory reporting limits attain the applicable state and/or federal standards and/or screening levels?
    - Is the sample set sufficient to develop site-specific removal and disposal treatment methodologies?
    - Have sufficient data been collected to evaluate how factors including physical characteristics of the site and climate and water table fluctuations affect contaminant fate and transport?
    - Have sufficient data been collected to determine the toxicity, environmental fate, and other significant characteristics of each hazardous substance present?
    - Is the data set sufficient to evaluate the potential extent and risk of future releases of hazardous substances, which may remain as residual contamination at the source facility?

Principal investigators, in conjunction with the project team, will formulate solutions if data gaps are found as a result of problems, biases, trends, etc., in the analytical data, or if conditions exist that were not anticipated in the development of the DQOs. It is particularly important that each data usability evaluation specifically address any limitations on the use of the data that may result from a failure to achieve the stipulated DQO.

When the data do not meet the project DQOs, WESTON will investigate the root cause to the deficiency. Reasons may include laboratory operation, such as the failure of laboratory reporting limits to meet site criteria. In these situations, WESTON will discuss corrective actions with the TBA WAM. These actions may include:

- Re-sampling for all or some of the parameters.
- Preparing a technical memorandum to the site file, detailing limitations to the data.

- Validating the data at a higher tier level to better qualify the results.
- Preparing a technical memorandum determining the bias of field results.

If the project scope changes, the DQOs will be expanded. The DQOs will address the specific action limits and measurable performance criteria, in order to make appropriate decisions on the analytical data.

DQIs, such as precision, accuracy, completeness, representativeness, and comparability measurements, aid in the evaluation process and are discussed below.

Precision

The most commonly used estimates of precision are the RPD for cases in which only two measurements are available, and the percent RSD (%RSD) when three or more measurements are available. This is especially useful in normalizing environmental measurements to determine acceptability ranges for precision because it effectively corrects for the wide variability in sample analyte concentration indigenous to samples.

Precision is represented as the RPD between measurement of an analyte in duplicate samples or in duplicate spikes. RPD is defined as follows:

$$RPD = \frac{|C_1 - C_2|}{\frac{C_1 + C_2}{2}} \times 100$$

Where:

C_1 = First measurement value
C_2 = Second measurement value

For field measurements such as pH, where the absolute variation is more appropriate, precision is often reported as the absolute range (D) of duplicate measurements:

$$\%D = m1 - m2$$

Where:
$m1$ = First measurement value
$m2$ = Second measurement value
The % RSD is calculated by the standard deviation of the analytical results of the replicate determinations relative to the average of those results for a given analyte. This method of precision measurement can be expressed by the formula:

$$\%\,RSD = \frac{\sqrt{\sum_{I-1}^{N}\left(\frac{RF_i - RF}{N-1}\right)}}{RF} \times 100$$

Where:

RF = Response factor
N = Number of measurements

Precision control limits for evaluation of sample results are established by the analysis of control samples. The control samples can be method blanks fortified with surrogates (e.g., for organics), or LCS purchased

commercially or prepared at the laboratory. The LCS is typically identified as blank spikes (BS) for organic analyses. For multi-analyte methods, the LCS or BS may contain only a representative number of target analytes rather than the full list.

The RPD for duplicate investigative sample analysis provides a tool for evaluating how well the method performed for the respective matrix.

Accuracy/Bias

Accuracy control limits are established by the analysis of control samples, which are water and/or solid/waste matrices. For organic analyses, the LCS may be a surrogate compound in the blank or a select number of target analytes in the blank spike. The LCS is subjected to all sample preparation steps. When available, a solid LCS may be analyzed to demonstrate control of the analysis for soil. The amount of each analyte recovered in an LCS analysis is recorded and entered into a database to generate statistical control limits. These empirical data are compared with available method reference criteria and available databases to establish control criteria.

The %R for spiked investigative sample analysis (e.g., matrix spike) provides a tool for evaluating how well the method worked for the respective matrix. These values are used to assess a reported result within the context of the project data quality objectives. For results that are outside control limits provided as requirements in the QAPP, corrective action appropriate to the project will be taken and the deviation will be noted in the case narrative accompanying the sample results. Percent recovery (%R) is defined as follows:

$$\%\,\text{Recovery} = \frac{(A_T - A_0)}{A_F} \times 100$$

Where:

A_T = Total amount recovered in fortified sample
A_0 = Amount recovered in unfortified sample
A_F = Amount added to sample

Accuracy for some procedures is evaluated as the degree of agreement between a new set of results and a historical database or a table of acceptable criteria for a given parameter. This is measured as percent difference (%D) from the reference value, and is primarily used by the laboratory as a means for documenting acceptability of continuing calibration.

The %D is calculated by expressing, as a percentage, the difference between the original value and new value relative to the original value. This method for precision measurement can be expressed by the formula:

$$\%D = \frac{C_1 - C_2}{C_1} \times 100$$

Where:

C_1 = Concentration of analyte in the initial aliquot of the sample.
C_2 = Concentration of analyte in replicate.

The laboratory will review the QC samples and surrogate recoveries for each analysis to ensure that the %R lies within the control limits listed in the QAPP. Otherwise, data will be flagged by the laboratory.

For field measurements such as pH, accuracy is often expressed in terms of bias (B) and is calculated as follows:

$$B = M - A$$

Where:

M = Measured value of Standard Reference Material (SRM)
A = Actual value of SRM

Representativeness

Representativeness is the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. It is a qualitative parameter that depends on proper design of the sampling program.

Data representativeness for this project is accomplished by implementing approved sampling procedures and analytical methods that are appropriate for the intended data uses, and which are established within the site-specific FSP, SAP, and/or QAPP.

Field personnel will be responsible for collecting and handling samples according to the procedures in this QAPP and the site-specific FSP, SAP, and/or QAPP so that samples are representative of field conditions. Errors in sample collection, packaging, preservation, or chain-of-custody procedures may result in samples being judged non-representative and may form a basis for rejecting the data.

Completeness

Project-specific completeness goals account for all aspects of sample handling, from collection through data reporting. The level of completeness can be affected by loss or breakage of samples during transport, as well as external problems that prohibit collection of the sample. The following calculation is used for determining the percent complete:

$$\text{Completeness} = \frac{A}{B} \text{ x } 100$$

Where:

A = Actual number of measurements judged valid (the validity of a measurement result is determined by judging its suitability for its intended use)
B = Total number of measurements planned to achieve a specified level of confidence in decision making

The formula for sampling completeness is:

$$\text{Sampling Completeness} = \frac{\text{Number of locations sampled}}{\text{Number of planned sample locations}} \text{ x } 100$$

An example formula for analytical completeness is:

$$\text{Metals Analytical Completeness} = \frac{\text{Number of Usable Data Points}}{\text{Expected Number of Usable Data Points}} \text{ x } 100$$

The ability to meet or exceed completeness objectives is dependent on the nature of samples submitted for analysis.

Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another, whether it was generated by a single laboratory or during inter-laboratory studies. The use of standardized field and analytical procedures ensures comparability of analytical data. Sample collection and handling procedures will adhere to U.S. EPA-approved protocols. Laboratory procedures will follow standard analytical protocols, use standard units, use standardized report formats, follow the calculations as referenced in approved analytical methods, and use a standard statistical approach for QC measurements.

Sensitivity

Sensitivity is the ability of the analytical test method and/or instrumentation to differentiate between detector responses to varying concentrations of the target constituent. Methodology to establish sensitivity for a given analytical method or instrument includes examination of standardized blanks, instrument detection limit studies, and calibration of the QL. The findings of the usability of the data relative to sensitivity will be included in the report, including any limitations on the data set and/or individual analytical results.

The Precision, Accuracy, Representativeness, Completeness, Comparability and Sensitivity MPC are described in Worksheets 12, 15, and 28. The following steps will be performed:

- Evaluate if the project required quantitation limits listed in Worksheet 15 were achieved for non-detected site contaminants. If no detectable results were reported and data are acceptable for the verification and validation steps, then the data are usable.
- If detectable concentrations are reported and the verification and validation steps are acceptable, the data are usable.
- If verification and validation are not acceptable, the data are qualified, estimated (J, UJ) for minor QC deviations that do not affect the data usability, or rejected for major QC deviations affecting data usability. The impact of rejected data will be evaluated and re-sampling may be necessary. Use of estimated data will be discussed in the project report.
- For statistical comparisons and mathematical manipulations, non-detect values will be represented by a concentration equal to one-half the sample-specific reporting limit. Duplicate results (original and duplicate) will not be averaged for the purpose of representing the range of concentrations. However, the average of the original and duplicate will be used to represent the concentration at that sample location.

Statistical tests will be conducted to identify potential outliers. Potential outliers will be removed if a review of the field and laboratory documentation indicates that the results are true outliers.

Method sensitivity is typically evaluated in terms of the method detection limit (MDL) and is defined as follows for many measurements:

$$MDL = {}^{t}(n - 1, 1 - \alpha = 0.99)\,(s)$$

Where:

s = Standard deviation of the replicate analyses

${}^{t}(n - 1, 1 - \alpha = 0.99)$ = Student's t-value for a one-sided 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom

n = Number of measurements

α = Statistical significance level

Graphics

Graphic figures will be generated to depict sample locations, as needed. Also, if necessary, figures will be generated to represent contaminant concentrations at each sampling location. Each figure will contain a detailed legend.

Reconciliation

DQOs will be examined to determine if the objective was met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of the major impacts observed from the data verification and validation, DQIs, and MPC assessments. Based on the results of these assessments, the quality of the data will be determined. Based on the quality determined, the usability of the data for each analysis will be determined. Based on the combined usability of the data from all analyses for an objective, it will be determined if the DQO was met and whether project action limits were exceeded. As part of the reconciliation of each objective, conclusions will be drawn, and any limitations on the usability of any of the data will be described.

ATTACHMENT B

U.S. EPA REGION 8 QA DOCUMENT REVIEW CROSSWALK

EPA REGION 8 QA DOCUMENT REVIEW CROSSWALK

QAPP/FSP/SAP for: *(check appropriate box)* [ ] **GRANTEE** [X] **CONTRACTOR** [ ] **EPA** [ ] **Other**	**Entity** *(grantee, contract, EPA AO, EPA Program, Other)* Weston Solutions, Inc.	**Regulatory Authority** **and/or** **Funding Mechanism**	___ **2 CFR 1500 for Grantee/Cooperative Agreements** _X_ **48 CFR 46 for Contracts** ___ **Interagency Agreement (FFA, USGS)** ___ **EPA/Court Order** ___ **EPA Program Funding** ___ **EPA Program Regulation** ___ **EPA CIO 2105**
Document Title ***[Note: Title will be repeated in Header]***	SAP for Place Bridge Elementary School		
QAPP/FSP/SAP Preparer	Roy Weindorf		
Period of Performance *(of QAPP/FSP/SAP)*	1 year from date of EPA approval of Task Level QAPP (Last QAPP Revision Feb 2015)	**Date Submitted for Review**	6/28/2018
EPA Project Officer **EPA Project Manager**	Joyce Ackerman Tim Rehder	**PO Phone #** **PM Phone #**	303-312-6822 303-312-6293
QA Program Reviewer or Approving Official	Tim Rehder	**Date of Review**	

***Documents Submitted for QAPP Review* (QA Reviewer must complete):**

1. QA Document(s) submitted for review:

QA Document	Document Date	Document Stand-alone	Document with QAPP
QAPP		Yes / No	
FSP		Yes / No	Yes / No
SAP	**6/28/18**	Yes / No	Yes / No
SOP(s)			Yes / No

2. WP/SOW/TO/PP/RP Date _____
WP/SOW/TO/RP Performance Period _____

3. QA document consistent with the:
WP/SOW/PP for grants? Yes / No
SOW/TO for contracts? Yes / No

4. QARF signed by R8 QAM Yes / No / NA
Funding Mechanism IA / contract / grant / NA
Amount _____

Notes for Document Submittals:

1. A QAPP written by a Grantee, EPA, or Federal Partner must include for review: Work Plan(WP) / Statement of Work (SOW) / Program Plan (PP) / Research Proposal (RP) and funding mechanism

2. A QAPP written by Contractor must include for review:
a) Copy of Task Order Work Assignment/SOW
b) Reference to a hard or electronic copy of the contractor's approved QMP
c) Copy of Contract SOW if no QMP has been approved
d) Copy of EPA/Court Order, if applicable
e) The QA Review must determine (with the EPA CO or PO) if a QARF was completed for the environmental data activity described in the QAPP.

3. a. Field Sampling Plan (FSP) and/or Sampling & Analyses Plan (SAP) must include the Project QAPP ***or*** must be a stand-alone QA document that contain all QAPP required elements (Project Management, Data Generation/Acquisition, Assessment and Oversight, and Data Validation and Usability).

b. SOPs must be submitted with a QA document that contains all QAPP required elements.

Summary of Comments *(highlight significant concerns/issues)*:

1. Comment #1
2. Comment #2
3. Comment #3
4. Weston Solutions, Inc. **must address the comments in the Summary of Comments, as well as those identified in the Comment section(s) that includes a "Response (date)" and Resolved (date)".**

Element	Acceptable *Yes/No/ NA*	Page/ Section	Comments
A. Project Management			
A1. Title and Approval Sheet			
a. Contains project title	Yes	SAP Title Page and Introduction SAP Section A1.	
b. Date and revision number line (for when needed)	Yes	SAP Section A1	
c. Indicates organization=s name	Yes	SAP Title Page	
d. Date and signature line for organization=s project manager	Yes	SAP Section A1 QAPP Worksheets 1,2 4,7 & 8	
e. Date and signature line for organization=s QA manager	Yes	QAPP Worksheets 1& 2	
f. Other date and signatures lines, as needed	Yes	SAP Section A1 QAPP Worksheets 4,7 & 8	
A2. Table of Contents			
a. Lists QA Project Plan information sections	Yes	SAP Table of Contents, SAP List of Appendices	
b. Document control information indicated	Yes	SAP Section A1 QAPP Worksheet 1 & 2	
A3. Distribution List			
Includes all individuals who are to receive a copy of the QA Project Plan and identifies their organization	Yes	SAP Section A3 QAPP Worksheet 3 & 5	
A4. Project/Task Organization			
a. Identifies key individuals involved in all major aspects of the project, including contractors	Yes	QAPP Worksheet 3 & 5	
b. Discusses their responsibilities	Yes	QAPP Worksheet 4, 7 & 8	
c. Project QA Manager position indicates independence from unit generating data	Yes	QAPP Worksheet 3 & 5	
d. Identifies individual responsible for maintaining the official, approved QA Project Plan	Yes	SAP Section A1 QAPP Worksheet 4, 7 & 8	
e. Organizational chart shows lines of authority and reporting responsibilities	Yes	QAPP Worksheet 3 & 5	
A5. Problem Definition/Background			
a. States decision(s) to be made, actions to be taken, or outcomes expected from the information to be obtained	Yes	SAP Section A5 QAPP Worksheet 9	
b. Clearly explains the reason (site background or historical context) for initiating this project	Yes	SAP Worksheet 10	
c. Identifies regulatory information, applicable criteria, action limits, etc. necessary to the project	Yes	SAP Section A5 and Worksheet 15	
A6. Project/Task Description			

a. Summarizes work to be performed, for example, measurements to be made, data files to be obtained, etc., that support the project=s goals	Yes	SAP Section A6 SAP Worksheet 14 & 16	
b. Provides work schedule indicating critical project points, e.g., start and completion dates for activities such as sampling, analysis, data or file reviews, and assessments	Yes	SAP Worksheet 14 & 16	
c. Details geographical locations to be studied, including maps where possible	Yes	SAP Section A6	
d. Discusses resource and time constraints, if applicable	Yes	SAP Section A6	
A7. Quality Objectives and Criteria			
a. Identifies - performance/measurement criteria for all information to be collected and acceptance criteria for information obtained from previous studies, - including project action limits and laboratory detection limits and - range of anticipated concentrations of each parameter of interest	Yes	SAP Worksheet 15 QAPP Worksheet 13 QAPP Worksheets 12.1 - 12.4	
b. Discusses precision	Yes	QAPP Worksheet 37	
c. Addresses bias	Yes	QAPP Worksheet 37	
d. Discusses representativeness	Yes	QAPP Worksheet 37	
e. Identifies the need for completeness	Yes	QAPP Worksheet 37	
f. Describes the need for comparability	Yes	QAPP Worksheet 37	
g. Discusses desired method sensitivity	Yes	QAPP Worksheet 37	
A8. Special Training/Certifications			
a. Identifies any project personnel specialized training or certifications	Yes	SAP Section A4 QAPP Worksheet 4, 7 & 8	
b. Discusses how this training will be provided	Yes	QAPP Worksheet 4, 7 & 8	
c. Indicates personnel responsible for assuring training/certifications are satisfied	Yes	QAPP Worksheet 4, 7 & 8	
d. identifies where this information is documented	Yes	QAPP Worksheet 4, 7 & 8	
A9. Documentation and Records			
a. Identifies report format and summarizes all data report package information	Yes	SAP Worksheet 14 & 16 QAPP Worksheet 29	
b. Lists all other project documents, records, and electronic files that will be produced	Yes	SAP Worksheet 14 & 16	
c. Identifies where project information should be kept and for how long	Yes	QAPP Worksheet 29	
d. Discusses back up plans for records stored electronically	Yes	SAP A9. QAPP Worksheet 29	
e. States how individuals identified in A3 will receive the most current copy of the approved QA Project Plan, identifying the individual responsible for this	Yes	SAP Introduction QAPP Worksheet 4 & 5	
B. Data Generation/Acquisition			
B1. Sampling Process Design (Experimental Design)			

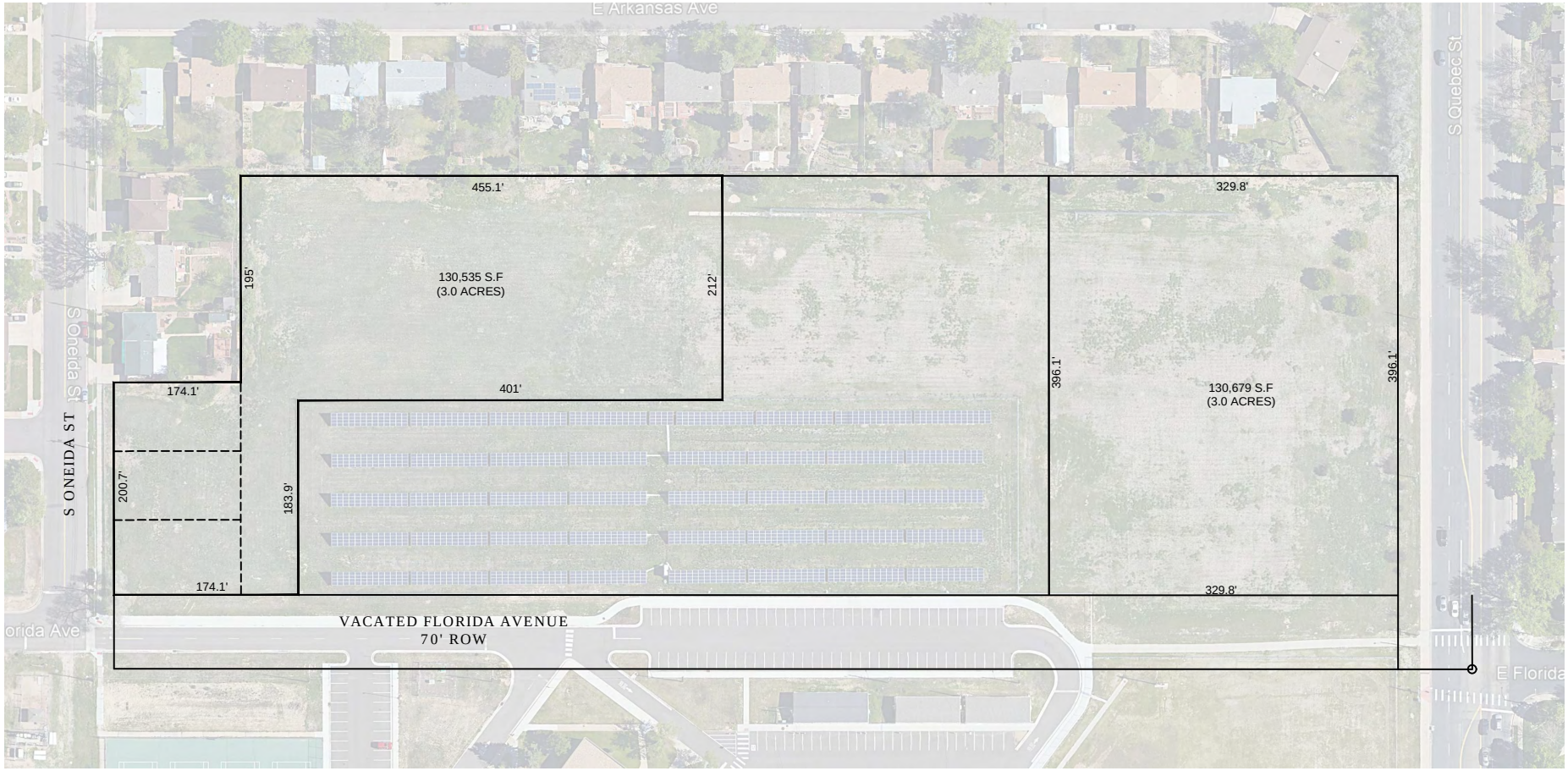
a. Describes and justifies design strategy, indicating size of the area, volume, or time period to be represented by a sample	Yes	SAP Section B1. SAP Table 1	
b. Details the type and total number of sample types/matrix or test runs/trials expected and needed	Yes	SAP Section B1. SAP Table 1	
c. Indicates where samples should be taken, how sites will be identified/located	Yes	SAP Section B1. SAP Table 1	
d. Discusses what to do if sampling sites become inaccessible	Yes	SAP Section B1.	
e. Identifies project activity schedules such as each sampling event, times samples should be sent to the laboratory, etc.	Yes	SAP Worksheet 14 & 16 SAP Table 1	
f. Specifies what information is critical and what is for informational purposes only	Yes	SAP Section B1.	
g. Identifies sources of variability and how this variability should be reconciled with project information	Yes	SAP Worksheets 17	
B2. Sampling Methods			
a. Identifies all sampling SOPs by number, date, and regulatory citation, indicating sampling options or modifications to be taken	Yes	SAP Section B2. QAPP Worksheet 21	
b. Indicates how each sample/matrix type should be collected	Yes	SAP Section B2. and SAP Table 1 QAPP Worksheet 19 & 30	
c. If in situ monitoring, indicates how instruments should be deployed and operated to avoid contamination and ensure maintenance of proper data	Yes	QAPP Worksheet 22	
d. If continuous monitoring, indicates averaging time and how instruments should store and maintain raw data, or data averages	Yes	QAPP Worksheet 22	
e. Indicates how samples are to be homogenized, composited, split, or filtered, if needed	Yes	SAP Section B2.	
f. Indicates what sample containers and sample volumes should be used	Yes	SAP Section B2. and SAP Table 1 QAPP Worksheet 19 & 30	
g. Identifies whether samples should be preserved and indicates methods that should be followed	Yes	SAP Section B2. and SAP Table 1 QAPP Worksheet 19 & 30	
h. Indicates whether sampling equipment and samplers should be cleaned and/or decontaminated, identifying how this should be done and by-products disposed of	Yes	QAPP Worksheet 21	
i. Identifies any equipment and support facilities needed	Yes	SAP Worksheet 22	
j. Addresses actions to be taken when problems occur, identifying individual(s) responsible for corrective action and how this should be documented	Yes	SAP Worksheet 31, 32 & 33	
B3. Sample Handling and Custody			
a. States maximum holding times allowed from sample collection to extraction and/or analysis for each sample type and, for in-situ or continuous monitoring, the maximum time before retrieval of information	Yes	SAP Table 1 QAPP Worksheet 19 & 30	

b. Identifies how samples or information should be physically handled, transported, and then received and held in the laboratory or office (including temperature upon receipt)	Yes	SAP Table 1 SAP Worksheet 26 & 27	
c. Indicates how sample or information handling and custody information should be documented, such as in field notebooks and forms, identifying individual responsible	Yes	SAP Section B3. SAP Worksheets 26 & 27	
d. Discusses system for identifying samples, for example, numbering system, sample tags and labels, and attaches forms to the plan	Yes	SAP Worksheet 26 & 27	
e. Identifies chain-of-custody procedures and includes form to track custody	Yes	SAP Worksheet 26 & 27	
B4. Analytical Methods			
a. Identifies all analytical SOPs (field, laboratory and/or office) that should be followed by number, date, and regulatory citation, indicating options or modifications to be taken, such as sub-sampling and extraction procedures	Yes	SAP Section B2. QAPP Worksheet 23	
b. Identifies equipment or instrumentation needed	Yes	QAPP Worksheets 23, 24	
c. Specifies any specific method performance criteria	Yes	QAPP Worksheets 23, 24	
d. Identifies procedures to follow when failures occur, identifying individual responsible for corrective action and appropriate documentation	Yes	QAPP Worksheet 22, 24	
e. Identifies sample disposal procedures	Yes	SAP Worksheet 26 & 27 QAPP Appendix I	
f. Specifies laboratory turnaround times needed	Yes	QAPP Worksheet 19 & 30	
g. Provides method validation information and SOPs for nonstandard methods	Yes	QAPP Worksheets 23, 25 & 28	
B5. Quality Control			
a. For each type of sampling, analysis, or measurement technique, identifies QC activities which should be used, for example, blanks, spikes, duplicates, etc., and at what frequency	Yes	SAP Section B5.	
b. Details what should be done when control limits are exceeded, and how effectiveness of control actions will be determined and documented	Yes	SAP Worksheets 25, 26 & 27 QAPP Worksheet 28	
c. Identifies procedures and formulas for calculating applicable QC statistics, for example, for precision, bias, outliers and missing data	Yes	SAP Worksheet 37	
B6. Instrument/Equipment Testing, Inspection, and Maintenance			
a. Identifies field and laboratory equipment needing periodic maintenance, and the schedule for this	Yes	SAP Worksheets 22, 24, and 25	
b. Identifies testing criteria	Yes	SAP Worksheets 22, 24, and 25	
c. Notes availability and location of spare parts	Yes	SAP Worksheets 22, 24, and 25	
d. Indicates procedures in place for inspecting equipment before usage	Yes	SAP Worksheets 22, 24, and 25	
e. Identifies individual(s) responsible for testing, inspection and maintenance	Yes	SAP Worksheets 22, 24, and 25	

f. Indicates how deficiencies found should be resolved, re-inspections performed, and effectiveness of corrective action determined and documented	Yes	SAP Worksheets 22, 24	
B7. Instrument/Equipment Calibration and Frequency			
a. Identifies equipment, tools, and instruments that should be calibrated and the frequency for this calibration	Yes	SAP Worksheets 22 and 24	
b. Describes how calibrations should be performed and documented, indicating test criteria and standards or certified equipment	Yes	SAP Worksheet 22, 26 & 27	
c. Identifies how deficiencies should be resolved and documented	Yes	SAP Worksheet 22, 26 & 27	
a. Identifies critical supplies and consumables for field and laboratory, noting supply source, acceptance criteria, and procedures for tracking, storing and retrieving these materials	Yes	SAP Attachment B SAP Attachment D SAP Worksheets 22, 26 & 27	
b. Identifies the individual(s) responsible for this	Yes	SAP Attachment B SAP Attachment D SAP Worksheets 22, 26 & 27	
B9. Use of Existing Data (Non-direct Measurements)			
a. Identifies data sources, for example, computer databases or literature files, or models that should be accessed and used	Yes	SAP Worksheet 13	
b. Describes the intended use of this information and the rationale for their selection, i.e., its relevance to project	Yes	SAP Worksheet 13	
c. Indicates the acceptance criteria for these data sources and/or models	Yes	SAP Worksheet 13	
d. Identifies key resources/support facilities needed	Yes	SAP Worksheet 13	
e. Describes how limits to validity and operating conditions should be determined, for example, internal checks of the program and Beta testing	Yes	SAP Worksheet 13	
B10. Data Management			
a. Describes data management scheme from field to final use and storage	Yes	SAP Worksheets 26 & 27, 29, and 35	
b. Discusses standard record-keeping and tracking practices, and the document control system or cites other written documentation such as SOPs	Yes	SAP Section B10. SAP Worksheets 26 & 27, 29	
c. Identifies data handling equipment/procedures that should be used to process, compile, analyze, and transmit data reliably and accurately	Yes	SAP Section B10. SAP Worksheets 22 and 29 QAPP Worksheet 23	
d. Identifies individual(s) responsible for this	Yes	SAP Worksheet 29	
e. Describes the process for data archival and retrieval	Yes	SAP Worksheet 29	
f. Describes procedures to demonstrate acceptability of hardware and software configurations	Yes	SAP Worksheet 22 QAPP Worksheet 23	
g. Attaches checklists and forms that should be used	Yes	SAP Section B10.	
C. Assessment and Oversight			
C1. Assessments and Response Actions			

a. Lists the number, frequency, and type of assessment activities that should be conducted, with the approximate dates	Yes	SAP Worksheet 31, 32 & 33	
b. Identifies individual(s) responsible for conducting assessments, indicating their authority to issue stop work orders, and any other possible participants in the assessment process	Yes	SAP Worksheet 31, 32 & 33	
c. Describes how and to whom assessment information should be reported	Yes	SAP Worksheet 31, 32 & 33	
d. Identifies how corrective actions should be addressed and by whom, and how they should be verified and documented	Yes	SAP Worksheet 31, 32 & 33	
C2. Reports to Management			
a. Identifies what project QA status reports are needed and how frequently	Yes	SAP Worksheet 31, 32 & 33	
b. Identifies who should write these reports and who should receive this information	Yes	SAP Worksheet 31, 32 & 33	
D. Data Validation and Usability			
D1. Data Review, Verification, and Validation			
Describes criteria that should be used for accepting, rejecting, or qualifying project data	Yes	SAP Worksheet 36	
D2. Verification and Validation Methods			
a. Describes process for data verification and validation, providing SOPs and indicating what data validation software should be used, if any	Yes	QAPP Worksheet 34 SAP Worksheets 35 and 36	
b. Identifies who is responsible for verifying and validating different components of the project data/information, for example, chain-of-custody forms, receipt logs, calibration information, etc.	Yes	SAP Worksheet 35	
c. Identifies issue resolution process, and method and individual responsible for conveying these results to data users	Yes	SAP Worksheets 35 and 36	
d. Attaches checklists, forms, and calculations	Yes	QAPP Worksheet 34 SAP Worksheet 37 QAPP Appendix O, P, Q, R	
D3. Reconciliation with User Requirements			
a. Describes procedures to evaluate the uncertainty of the validated data	Yes	SAP Worksheets 12 and 37 QAPP Appendix J	
b. Describes how limitations on data use should be reported to the data users	Yes	SAP Worksheet 37	

ATTACHMENT C
BACKGROUND INFORMATION


E Arkansas Ave
S Quebec St
S ONEIDA ST
S Oneida St
455.1'
195'
130,535 S.F
(3.0 ACRES)
212'
329.8'
396.1'
396.1'
130,679 S.F
(3.0 ACRES)
174.1'
401'
200.7'
183.9'
174.1'
329.8'
VACATED FLORIDA AVENUE
70' ROW
orida Ave
E Florida

ATTACHMENT D

EPA WAREHOUSE EQUIPMENT LIST

Equipment Check Out Log

Project Name: Place Bridge Taken By/Proj. Mgr : Roy Weindorf

Checked Out By: _____ Signature: _____

Date of Request: 11/26/2018 Date Needed: 12/17/2018 Projected Return: 12/17/2018

Pulled	Scanned	Item Description	Decal Id #	Qty Requested	Qty Out	Qty In	Date Returned	Scanned In
		EM-31		1				
		GPS UNIT WITH BACKPACK		1				
		GPS DATA LOGGER		1				
		GEOPROBE		1				
		SLIDE HAMMER SOIL PROBE		1				
		POLY. TUBING (1/4 IN. [FT.]		200				
		FLEX TUBING (FT.)		6				
		PERISTAULTIC PUMP		1				
		MULTI RAE PRO		1				
		ZIP TOP BAGS (QUART SIZE)		30				
		HORIBA		1				
		WATER SAMPLE FILTER		6				
		SPRAY BOTTLE (DI, ALCONOX)		2				
		WATER (5 G)		1				
		BUCKETS (5 G)		2				
		BRUSH		2				
		PAPER TOWEL ROLL		1				
		GEOPROBE SUPPLIES :						
		SOIL LINERS		24				
		VAPOR PROBES		12				
		SAND		1				
		BENTONITE		5				